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BUREAU OF EDUCATION

INDUSTRIAL PLANT OF THE PHILIPPINES

*Description of the Chief Industrial Plants
of the Philippines, their Dis-
tribution, Method of Prepara-
tion, and Uses*

By
Theodore Muller



MANILA
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[Abbreviated list.]

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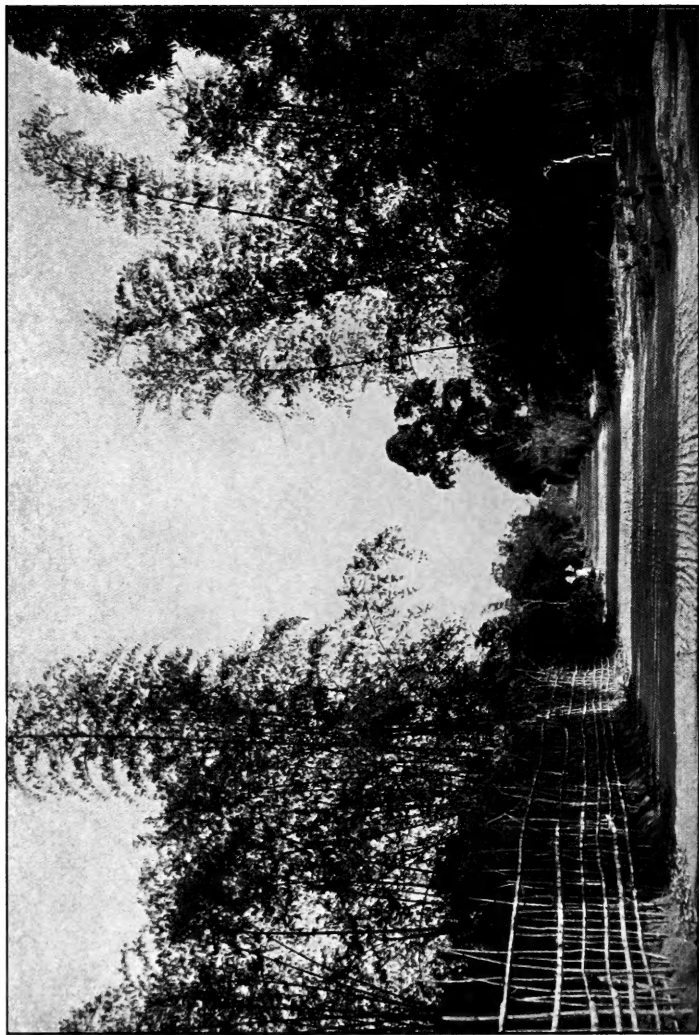
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THE SPINY BAMBOO (*Bambusa blumeana*) IS COMMON AND ABUNDANT IN ALL THE SETTLED, CIVILIZED REGIONS OF THE PHILIPPINES.

BULLETIN No. 49—1913
BUREAU OF EDUCATION

INDUSTRIAL FIBER PLANTS OF THE PHILIPPINES

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tribution, Method of Prepara-
tion, and Uses*

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Theodore Muller



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KEY TO ABBREVIATIONS.

B.=Bicol.
B. of S.=Bureau of Science.
E.=English.
F.=Filipino.
Gad.=Gaddan.
Iban.=Ibanag.

Il.=Ilocano.
Isi.=Isinay.
Pang.=Pangasinan.
Sp.=Spanish.
T.=Tagalog.
Vis.=Visayan.



FOREWORD.

The first edition of this bulletin is a preliminary one. No attempt is made to treat industrial fiber plants exhaustively. The botanical description has been made as non-technical as possible and the preparation and uses of fibers have been discussed so as to give a general idea of their treatment and possibilities. The publication is intended primarily to serve superintendents and teachers as something definite and tangible on which to base suggestions, criticisms, and improvements. If errors have crept in they should be reported to the General Office, so that any future edition may be as accurate and as adapted to Philippine needs as superintendents and teachers in the Bureau of Education can make it. It is especially desired that a careful check be made of all plant names given and that fiber plants of economic value not described in this bulletin be reported.

No definite rules have been adopted in this bulletin for the spelling of native names. The most common way of spelling a word as shown in the correspondence of teachers with the General Office, Bureau of Education, has been adopted for the present.

The bulletin was prepared under the direction of Mr. Charles H. Magee, Assistant Director of Education, by Mr. Theodore Muller, in charge of the industrial museum, Bureau of Education. On a number of matters relating to the bulletin, the writer had the advice and assistance of Mr. Hugo H. Miller, head of the department of industrial information, Bureau of Education.

The botanical specimens which were sent in by the field to the Bureau of Education in response to Circular No. 175, series 1910, and which form the basis for this bulletin, were determined at the Bureau of Science.

Botanical descriptions are founded chiefly on "A Flora of Manila"¹ by Mr. Elmer D. Merrill, botanist, Bureau of Science, Manila, P. I., and on a study of the plant specimens in the industrial museum of the Bureau of Education. The writer is also deeply indebted to Mr. Merrill for many helpful suggestions.

Drawings in this bulletin are by Mr. Juan Santos, a student in the University of the Philippines.

Acknowledgment is due for the review of this bulletin in the manuscript to Mrs. T. E. Borden, Mrs. C. E. Anderson, Messrs. H. H. Miller, E. D. Merrill, L. R. Sawyer, J. F. Minier, Luther Parker, U. S. Andes, R. B. Robinson, and Chester G. Farnsworth.

Credit for the information given on the preparation of materials is due to the reports of division superintendents and teachers kept on file in the industrial information department, Bureau of Education, to the Albay Industrial Bulletin No. 4, 1911, and to a number of publications of the Bureau of Education. In part, the information has been compiled from personal observation of the writer.

Prices for industrial fibers are not quoted in this bulletin, although various kinds have a commercial value in places where they have been used to any extent. The prices generally soar as soon as it becomes evident that the fibers are desirable and needed in any quantity.

The uses of plants have been determined chiefly by examination of the articles kept in the industrial museum of the Bureau of Education.

It is not possible to mention the hundreds of persons whose ideas on different phases of industrial work, as expressed in correspondence with the General Office, Bureau of Education, have been of help to the writer; special mention, however, is made whenever deemed of sufficient importance.

Common names have been adopted for the industrial fiber plants described in this bulletin. In most cases, these

¹ Practically a complete flora of the cultivated areas in the Philippines. Descriptions, with keys, of over 1,000 species, 590 genera, and 136 families. Price ₱5. For sale by the Bureau of Science, Manila, P. I.

names are Filipino; in a few, English. It is hoped that the names suggested will become general throughout the Islands, not because of any special merit in any one of them, but in order to facilitate communication and attain some degree of uniformity in their use. No violence will be done to the local name existing in any one locality, for close questioning will bring out the fact that except for the very common plants local names are not dependable and are applied carelessly and indifferently to various plants.

If more specific information is desired on any one point discussed in the bulletin, it will be furnished whenever possible by the Bureau of Education through its industrial and publications division, or, if of sufficient general interest, through the medium of THE PHILIPPINE CRAFTSMAN.

In order that the industrial museum of the Bureau of Education may continue to be a success, it needs the active, hearty coöperation of division superintendents and teachers at all times. Attention is therefore especially invited to Bulletin No. 46 dealing with the industrial museum, library, and exhibits of the Bureau of Education in which the aims and purposes of the museum are fully discussed.

FRANK L. CRONE,
Director of Education.

MANILA, P. I., *September 10, 1913.*

INDUSTRIAL FIBER PLANTS OF THE PHILIPPINES.

Chapter I.—INTRODUCTORY.

A number of household industries are firmly established in the Philippines. These industries may, however, be further developed if greater use is made of the fiber plants found in the fields and forests throughout the Archipelago. The Philippine sylvan plants that furnish industrial materials are, as a rule, not massed together in great stands, but are found scattered over a large territory crowded in among many other species of plants.

At present, the market for Philippine fiber products is excellent, and for many years the demand for them will be greater than the supply. No foreign material need be imported for the fabrication of these products, and only at times is machinery of even the simplest type necessary for the work.

In some places the petioles, midribs, and leaves of a variety of palms, such as sugar, buri, nipa, coconut, and the like, furnish the material. In other places, air roots are found in plenty for the making of excellent articles. In still others, the dried fiber or skin of the abaca petiole can be utilized to advantage for many purposes. In some localities, tropical vines (ex. *pamago*) are well adapted for industrial work. In nearly all parts of the Islands the stems of many species of ferns can be used in a number of ways.

Banban (*Donax cannaeformis*) is common along streams and brooks in all provinces and makes an excellent industrial material. The bast fibers of many trees can be utilized for

rope. Pandans (screw pines), rattan, sedges, or grasses can be used, and for all ordinary purposes bamboo will be found serviceable in many branches of industrial work. As time goes on, more and more raw material will be found well adapted for Philippine industrial needs.

In using the various plant fibers, it should be remembered that they are more or less hygroscopic—that is, they will often shrink or expand according to the amount of moisture in the atmosphere. If it is desired to do a high grade of work with fine straws of various kinds it is generally very essential that they be worked at a time when there is the most moisture in the air, which would be mornings, evenings, or on rainy or cloudy days. It may be stated that, as a rule, the more moist a fiber is, the more pliable it is; the drier, the more brittle. It is equally true that the finer the fiber, the more it seems to be affected by atmospheric conditions.

In basketry, most of the raw materials found in the Philippines require no artificial dyes to enhance the beauty of their natural colors. Jet-black, brown, white, yellow, and green of various tones are easily obtainable by proper manipulation of the material.

The attempt is sometimes made to obtain industrial fiber plants from a far-distant province in the erroneous belief that such material is very superior. In many instances just as good or better material can be obtained in the immediate vicinity. In general, schools should work with the industrial material they find in their own district or province. If sufficient effort is made, such can usually be found, though it may be harder in some localities than in others. Industrial supervisors from the General Office have gone to districts where it was alleged that little or no industrial material existed and found material of one kind or another in plenty, which had not been previously recognized locally.

The use of foreign fabrics in the finishing of articles from Philippine fibers should be avoided whenever possible. For example, there is little need for velvet edges on buri raffia cushions and mats, or for velvet straps on abacá slippers, or for colored yarn on cheap sedge slippers. The

use of a native material in such and similar cases is not only more economical, but often results in a better-looking article.

In general, the aim in industrial work with fibers should be to use Philippine raw materials exclusively and to produce articles by hand or by simple implements operated by hand, that can not be duplicated on power machines.

In collecting plants for industrial purposes too little attention is often given to the selection of the best material available. The inexperienced person in search of industrial material will often cut down industrial plants indiscriminately without heeding whether they are too young or too old, good or indifferent, or whether they have flaws, decayed spots, and imperfections. A little scrutiny in collecting plants will save much trouble when the material is to be worked up.

Every one collecting industrial materials should be cautioned not to exterminate all specimens of a plant in a given area. While it may be true that there exists a bountiful supply of certain plant materials in a great number of districts, yet care should be had for the future, and no plants should be cut down that are not needed, nor should the whole supply be wiped out. Some plants should always be left. Better results are obtained by gathering some material from young plants, some from old plants, some from plants growing in the shade, and some from similar plants in high places. By such procedure, variation in design and better effects can be secured and a steady supply of plants insured from year to year.

Few, if any, attempts have as yet been made to cultivate the industrial fiber plants found at present growing wild in field and forest. Experiments along this line would therefore prove of great interest.

To carry on industrial work successfully, supervising teachers and division industrial supervisors will find it necessary to make a close study of the plants within their districts. It will be found convenient as well as instructive to have each Filipino teacher in the district make a collection of the industrial fiber plants found within the barrio. It is

a comparatively easy matter to dry, poison,¹ and mount specimens. Such a collection (herbarium) will be of value to the school in many different ways. From the collection of this material by barrio or other teachers the supervising teacher should make his collection for the district. In turn, the industrial supervisor should make a collection of the industrial plants of the province to be kept on file in the office of the division superintendent.

It is hoped that by a study of this bulletin teachers will be able to classify and arrange many of the industrial plants systematically. If any difficulty is encountered in naming plants, the specimens should be sent to the General Office, along with accurate and detailed information concerning the structure, habitat, preparation, and uses of the plant. Duplicates should be kept and both these and the original should be numbered so that a reply can be sent without sending back the plant specimen. It would also be a good plan to work out maps for the various districts showing where materials are found and in what quantities they are obtainable.

¹ It is necessary to poison plants in the Philippines to keep them from being destroyed by insects. Such poison is prepared by dissolving 2 tablets of bichloride of mercury in about 1 liter of denatured alcohol (sufficient bichloride should be used to make a saturated solution). The specimens are then dipped in this solution and dried. *Do not put the hands in the solution*, but handle the specimens with a pair of tongs made of bamboo or some other material.



NITO (*Lygodium circinnatum*).

Chapter II.—FERNs.

Ferns have leaves, roots, and stems like ordinary green plants, but neither flowers nor seeds. Instead of these, they have reproductive bodies known as spores, which generally occur on the undersurface of the leaves.

In height, ferns vary greatly; some are small, hardly rising above the ground, while others are treelike in size. Young leaves are often fuzzy and hairy and curled like a question mark.

Ferns are most often found in cool, shady places along the banks of brooks and streams or in the shade of the forest. In the Philippines, the young stems of some ferns (ex. *paco*) are sold in the market for food, and the stems of others furnish good industrial fibers.

(a) TWINING FERNS.

The term "nito" is commonly applied to all "twining" ferns. Filipinos speak of different kinds of nito, but have no special name for each kind. These various kinds correspond to the different species of *Lygodium*.¹

The species of *Lygodium* have underground rootlike stems (rhizomes) and stems above the ground of indefinite growth. They are found in the Tropics of both hemispheres and extend to New Zealand, Japan, and the New England States of the United States of America.

NITO.

(*Lygodium* spp.; *L. circinnatum*; *L. flexuosum*; *L. japonicum*; *L. semihastatum*.)

The most common nito, occurring throughout the Philippines, is *Lygodium circinnatum*.² In this species, the petioles arising from the main stem generally divide into two equal parts. Each of the two smaller petioles bears a

¹ The name *Lygodium* is derived from the Greek word meaning "twining."

² Nito (*Lygodium circinnatum*): Nito (Antique, Bohol, Cagayan, Camarines, Capiz, Cavite, Cebu, Ilocos Norte and Sur, Iloilo, Isabela, Laguna, Leyte, Misamis, Occidental Negros, Oriental Negros, Pangasinan, Sorsogon, Surigao, Tayabas, Union, Zambales); agsam (Albay); naui (Zamboanga).

leaf. The leaf is divided almost to its base into a number of lobes. These lobes are entire and usually about 15 cm. long and from 1.5 to 3 cm. wide. The lobes bearing spores are always smaller than the sterile ones.

*Lygodium flexuosum*¹ grows to be several meters long. Its stem is somewhat ridged. The leaflets (segments), rather lancelike in form, are from 15 to 20 cm. long, and from 10 to 20 mm. wide and finely serrated at the margin. The lower leaves are borne on short petioles, the upper ones are almost sessile (without petioles). The species is widely distributed in the Philippines and is also found from India and southern China southward to Australia.

Another species, *Lygodium japonicum*,² is a very slender twining fern from 1 to 3 m. in length. It is found occasionally in open dry grasslands, dry thickets, and similar localities. It is widely distributed in the Philippines and also occurs in Japan, from Korea to India, and southward to Australia.

*Lygodium semihastatum*³ is similar in appearance to *Lygodium circinnatum*, but may be distinguished from it by the presence of an earlike projection at the base, on one side or sometimes on both sides of the leaf lobe.

The four species mentioned are the most prominent of those spoken of as "nito," though there are altogether about 10 species of twining ferns in the Philippines. As these ferns get older and climb and twine around plants, they lose many of their leaves and the stems become discolored, the change being from green to light brown, brown, dark brown, and finally black.

¹ Nito (*Lygodium flexuosum*): Nito (Cebu, Cavite, Iloilo, Samar); nitu (Iban. in Isabela); kalulung (Iban. in Isabela); sasitang (Il. in Isabela). Collected also by B. of S. in Bataan, Batangas, Cagayan, Davao, Laguna, Oriental Negros, Nueva Vizcaya, Rizal, Union, Zambales.

² Nito (*Lygodium japonicum*): Nito (Il. in Isabela); karekay (Iban. in Isabela). Collected also by B. of S. in Bataan, Batangas, Bontoc, Benguet, Bulacan, Butuan, Cagayan, Davao, Ilocos Norte, Laguna, Leyte, Mindoro, Nueva Ecija, Rizal, Tayabas, Zamboanga.

³ Nito (*Lygodium semihastatum*): Nito (Sorsogon); anton (Albay). Collected also by B. of S. in Cagayan, Laguna, Mindoro, Occidental Negros, Tayabas.

DISTRIBUTION.

Nito should be looked for in rather moist, shaded localities. It is found growing on hillsides where timber is not very heavy, in open woodland, and sometimes in or near abaca plantations, bordering cogonales, or twining about underbrush in moist places.

PREPARATION.

It is better and easier to prepare the material while fresh than when hard and dry. Old material can be immersed in water and made more pliable.

Nito splints.—To prepare nito splints, the stem is divided into halves and quarters. If the diameter of the stem is very small, a division into three parts will be sufficient. In brown nito, the epidermis is generally first removed. It is best to start the splitting with a knife at one end and continue it to the other end by running the thumb in between the sections. The inside of these strips may then be pared down to the thickness wanted. If it is desired to have all strips of the same width, they may be passed through a gauge (batakan).¹

Coloring nito.—The bottom of the stem, being older than the rest, is often of a darker color. The major portion of the stem itself may be of an uneven color. Browns give richer and warmer color effects than blacks. The latter, when used, must have uniform density:²

Take a young coconut about half grown and cut it into small pieces. Secure a section of sappan wood (*Caesalpinia sappan*)—a piece of the trunk is best, about a foot long—and split it lengthwise into thin pieces. Place both chopped coconut and sappan strips in a pot or can with about a gallon of water and boil for half an hour. Then take the nito and place it in the solution and let it boil for about twenty minutes. Afterwards remove the nito and bury it in moist mud, where it should be left for half a day. It may then be removed and cleaned by washing. It will be found to have a deep, jet-black color.³

¹ A "batakan" is easily made from the top of a tin can by punching it full of openings of the desired diameter.

² THE PHILIPPINE CRAFTSMAN, July, 1912, p. 76.

³ Rattan, bamboo, and banban may also be dyed in the same manner.

As a substitute for the mud bath, lime may be employed in the dye mixture. A small amount should be added to the dyeing solution after the coconut and sappan have been boiled together and the material then placed in the solution and boiled. As a rule, this method will give as satisfactory a color as the first.

Mr. Claude Miller, supervising teacher of Balanga, Bataan, in a communication to the General Office of the Bureau of Education, describes an interesting process of obtaining all-black nito, in which neither boiling nor dye of any kind is necessary. As it also has been found successful, it is here given:

The results of experiments carried on in Balanga and other towns of this district seem to show that nito of whatever shade of color can be colored a jet-black by burying it in wet mud from three to six days. The stems should be fully grown, or nearly so, and at least partly dried, as the young nito or that which is full of sap does not color successfully.

Most of the teachers and pupils prefer to split the nito previous to burying it in the mud, because it splits easier and takes only about half the time to color.

The length of time the nito should be left in the mud varies with the original color, the lighter-colored stems requiring a longer time to become black. The mud in which the stems are buried should be very wet. The best results are obtained by burying the stalks in the bottom of ponds or streams or ditches. When taken from the ground, after being buried for from three to six days, the nito has a dull color, but it can be polished by rubbing it for a short time.¹

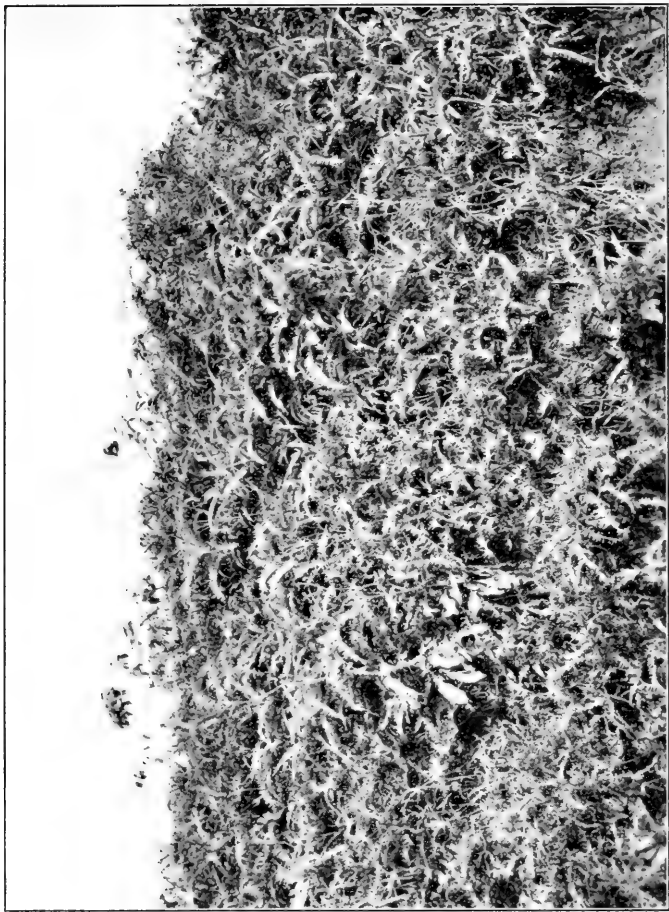
USES.

Basketry.—In Samar nito splints with the colored epidermis scraped off are used in the manufacture of various articles of basketry, such as circular button boxes, collar and tie boxes, and the like. Although the splints used in these baskets may not all be of the same shade at first, in the course of time they assume an even, permanent brown color. In many provinces nito is successfully used in the decoration of the handles and rims of baskets.

¹ The following method for dyeing nito black has been used with success by Mr. Manuel Bacosa, division industrial supervisor, Palawan: "Into 5 liters of water put one glass of vinegar. Then mash 3.4 liters of 'canarem' berries (*Antidesma* sp.) and mix with the solution. Insert the prepared nito strips and boil for forty minutes. Allow the nito to remain in the liquid for twelve hours after boiling; then dry in the sun and polish with a dry cloth."



NITO (*Lygodium flexuosum*),
A TWINING FERN.



KILOG (*Gleichenia linearis*), A NONTWINING FERN GROWING IN PROFUSION ON HILLSIDES.

Hats.—In Pangasinan and Albay some hats are made entirely of nito or of nito combined with Calasiao splints. In a number of provinces the splints are used in the manufacture of the type of unblocked Philippine hat commonly known as "salakot."

Miscellaneous.—In several provinces very fine cigarette cases, pocketbooks, and similar articles are made from nito splints combined with Calasiao splints. Buri and nito are used with good effect for small articles of various kinds by having the under and wider strips of buri and the upper and narrower of nito. If nito splints only are used, a very pleasing effect can be secured by scraping away the black epidermis from the sides, thus having a central strip of black and on each side of it a white strip. Another variation consists in scraping the central part. This gives a white central strip and two black strips.

Union and Camarines Provinces manufacture riding whips in which black nito, or combinations of the various colored splints obtainable from this fern, are wound around rattan. To vary the designs on the whips, bamboo and irao strips are often used besides nito.

At the first Philippine exposition in 1912, the schools of Camarines showed napkin rings having a foundation of bamboo and wound about with bamboo and nito strips combined so as to form various designs. The Mangyans use the fern for belts or, with red-colored rattan, for head ornaments.

(b) NONTWINING FERNS.

There are four species of nontwining ferns at present utilized in industrial work. In these species, with one exception, the inner fibers are used, while in the twining ferns the outer epidermis region is generally utilized.

LOCDO.

(*Dryopteris pteroides*.)

Locdo (Samar). Collected also by B. of S. in Ilocos Norte, Laguna, Mindoro, Pampanga, Rizal, Zamboanga.

This fern grows to be over a meter high. It is usually found in shady places on hillsides and in valleys. Its leaflets are from 10 to 20 cm. long and about 2 cm. wide, and

taper to a point. The margins are cut in thirds to halves, forming oblong or triangular lobes. Locdo is found not only in the Philippines, but is of general distribution throughout Polynesia.

PREPARATION.

The stem of the fern is crushed, after which the cordlike inner fibers are readily removed.

USES.

The fibers may be used to obtain decorative weaves in baskets. It is not considered to be a very good material.

KILOG.

(*Gleichenia linearis*.)

Kilog (Laguna). Collected also by B. of S. in Albay, Benguet, Mindoro, Mindanao, Rizal, Tayabas.

This plant is a wide-spreading species of fern often forming tangled thickets. Its most striking feature is the peculiar forking leafy portion (frond). The fronds bearing spores may be forked once or several times. At the forking of the larger branches small leaflets occur. The lower part of the stem is light or dark-brown in color and several meters long (some by actual measurement were found to be 10 to 11 m. in length) and entirely free of leaves or branches. This is the part of the stem used as industrial material.

DISTRIBUTION.

The fern is found covering large areas on the sides of hills. It has been reported to the Bureau of Education from Laguna Province only, but also exists in other provinces, as the plant is one of the most widely distributed ferns in the Philippines.

PREPARATION.

The preparation of the material is simple. The hard, outer covering of the stem is cracked or crushed. From the soft light-brown inner tissue of the stem the dark-brown ribbonlike splints are then easily pulled out.



GLEICHENIA LINEARIS.

USES.

The splints are excellent weavers for coiled baskets. They can also be used with success in belts. The schools of Laguna learned the use of the material from its employment now and in former times on rice baskets for decorative purposes.

ALOLOKDO.

(*Nephrolepis hirsutula*.)

Alolokdo (Albay, Mindoro); korokalasag (Sorsogon). Collected also by B. of S. in Abra, Laguna, Mindoro, Occidental Negros, Rizal, Tayabas, Zamboanga.

The leaves of this fern are from 30 to 120 cm. long and 8 to 15 cm. wide. The leaflets (pinnæ), numerous and close together, usually have a toothed margin. They are at first more or less hairy on both surfaces, which later become smooth. The spores of this fern are borne on or very near the margin of the undersurface of the leaflets.

DISTRIBUTION.

The fern is found in dry thickets and is widely distributed throughout the Philippines.

PREPARATION.

To obtain the fibers, the stem is cracked and the inner fibers are pulled out. They are at first white in color but soon turn brown.

USES.

The fibers can be used for hats, mats, and baskets.

JAGNAYA.

(*Stenochlaena palustris*.)

Jagnaya (Sorsogon); agnaya (Palawan); hagnaya (Capiz, Iloilo, Laguna). Collected also by B. of S. in Butuan, Davao, Leyte, Surigao, Tayabas.

This fern occurs in the Philippines from Luzon to Davao, chiefly in thickets and in lowlands near the sea. The

whole leaf (frond) is from 50 to 80 cm. long and bears a considerable number of leaflets 10 to 12 cm. long and 2.5 cm. broad. The margins of the leaflets are sharply and finely serrated.

PREPARATION.

Ordinarily the stem is simply dried in the sun.

USES.

The fern is used for fish traps or twisted into rope. It is occasionally used in basketry, but should never be employed when better material is at all available.

Chapter III.—PANDANS.

Pandans,¹ or screw pines, are true tropical shrubs or trees. In distribution, however, they extend to the subtropics. They are called screw pines because the leaves of the plant are similar to those of the pineapple and arise from the stem in corkscrew fashion. The fruit also resembles that of the pineapple. Even the finest leaves of pandan can be distinguished from pineapple leaves, as in the former a row of more or less prominent spines is always present along the midvein. In texture, the coarsest pandan leaves never attain the thickness of maguey leaves, and the presence of a middle row of spines in the pandan leaves makes the distinction between them very evident.

Pandans occur along sandy beaches, in rather moist localities, on the sides of the mountains near fresh-water lakes and swamps. All develop more or less prominent air or prop roots above the ground. The fruits are multiple or composite.

KARAGUMOY.

(*Pandanus simplex*.)

Karagumoy (B.) (Albay, Camarines, Cebu, Leyte, Sorsogon, Tayabas).

The pandan karagumoy is of considerable economic importance in the Bicol Peninsula of Luzon. The leaves are of the same general shape as those of other pandans and from 2 to 3.5 m. long and 6 to 10 cm. wide. They are thick and coarse, provided with sharp spines, and greenish-gray in color when dried.

DISTRIBUTION.

This pandan is usually found near abaca plantations.

¹ See THE PHILIPPINE CRAFTSMAN, Vol. I, No. 4.

PREPARATION.

The spines on the leaves of this pandan are removed and the leaf itself, while still fresh, is split into four or more parts according to the purpose to which the strips are to be put. To get the strips of even width a simple gauge, called a "soclan"¹ in the Bicol language, is used. The strips are then generally dried in the shade and made more supple by being pressed firmly against a piece of bamboo.

USES.

Karagumoy leaves being coarse, mats and hats made from them never have the fine appearance of similar sabutan articles. At present karagumoy is the only pandan used in the making of work baskets. These are usually in the mad weave and have a bottom hexagonal in shape. Within the last few years the public schools in the Bicol Provinces have made this type of basket more elaborate and ornate by superimposing on the pandan strips stars or other figures of karagumoy, irao, or nito. The mad weave is also sometimes employed in karagumoy hats.

Karagumoy articles present a more shiny surface than those made of other pandans.

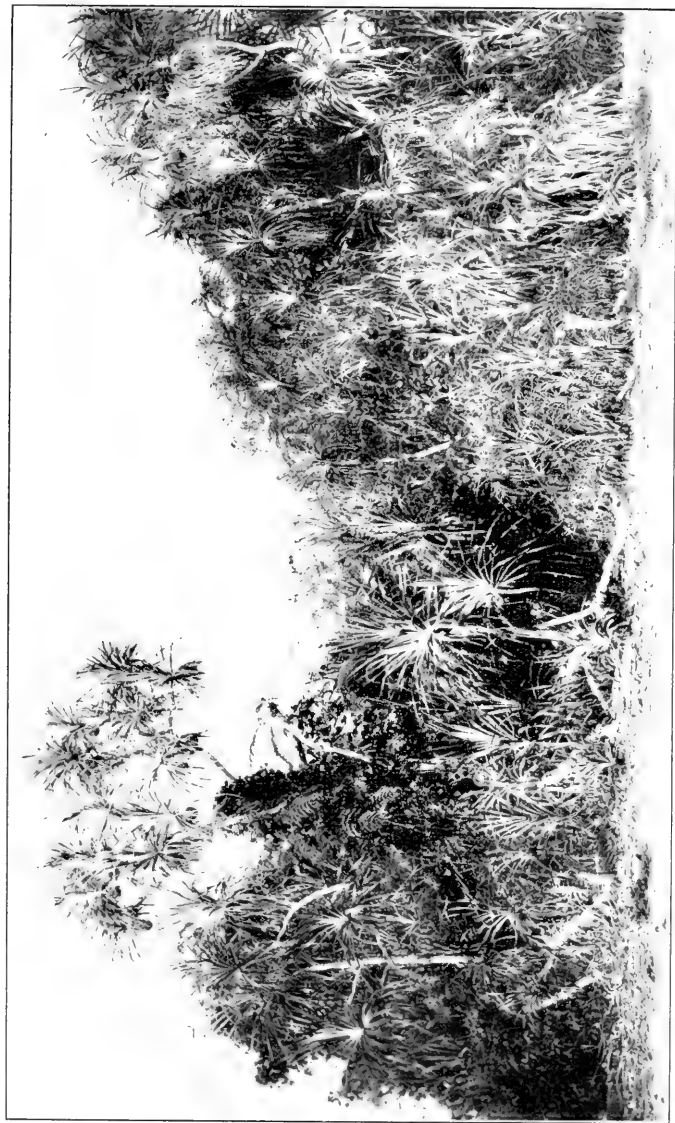
COMMON PANDAN.

(*Pandanus tectorius*.)

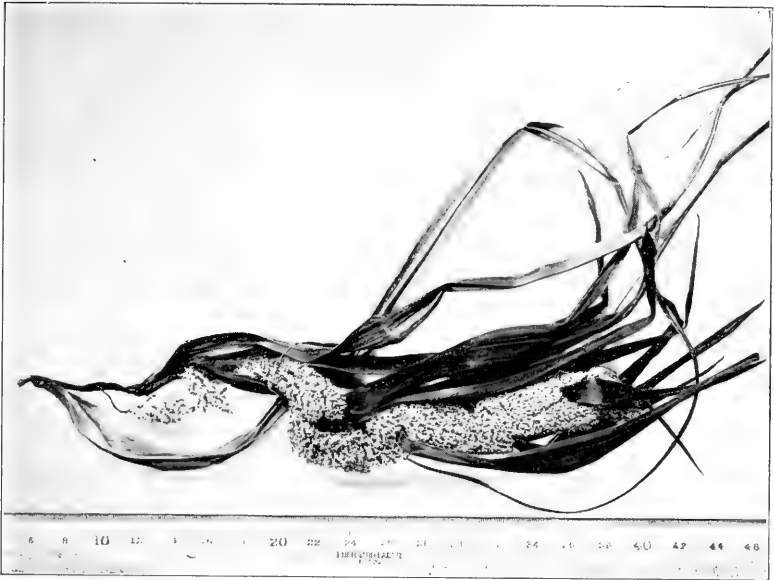
(Antique, Batangas, Bulacan, Cebu, Davao, Iloilo, Leyte, Mindoro, Oriental Negros, Pampanga, Rizal, Surigao, Tarlac, Tayabas, Zamboanga); pangdan (Abra); panglan (Il. in Zambales, Zambal); shore pandan.

Pandanus tectorius, the common pandan, is the most abundant and widely distributed of all pandans in the Philippines. Its trunk is never very high and like all species of pandans is figured by ridges which mark the attachment of former leaves. Several meters from the

¹ A "soclan" generally is a strip of bamboo or rattan bent in the shape of the letter U and held or tied together at the ends. The pandan is held in the curve of the U and a knife blade is held steadily against the arms of the U in such a way that when the pandan leaf is drawn through the soclan, the blade cuts the leaf evenly to the desired width.



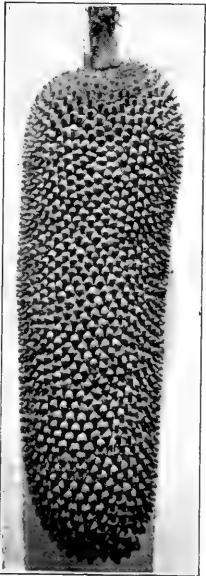
COMMON PANDAN (*Pandanus tectorius*).



FLOWER OF SABUTAN. COLLECTED AT TANAY, RIZAL.



FRUIT OF PANDANUS TECTORIUS.



FRUIT OF PANDANUS
UTILISSIMUS.

ground the bifurcation (forking) of the stem results in an odd-shaped crown peculiar to the plant. Aërial roots originate from the stem at some distance from the ground. They first serve to furnish air to the plant, but later penetrate the ground and act also as prop roots. The leaves are linear in shape, from 1 to 2 m. long and about 6 cm. wide, and provided with sharp spines along the margins and midvein. The fruit, roughly resembling a pineapple with its apex cut off, is about 20 cm. long and made up of small individual parts (drupes) very close together and furrowed on the exposed surface. When ripe, the fruit has a fine red color. The drupes finally loosen from the head and drop off.

DISTRIBUTION.

Common along the seashore in all parts of the Philippines.

PREPARATION.

Removal of the spines from the leaves and drying and bleaching the strips in the sun or by chemical agents (a solution of acids and hydrogen peroxide) are the main elements in the preparation of the strips. At present the strips are seldom used. It is believed, however, that if the same care and attention were given to their preparation as is done with sabutan and Majayjay pandans a satisfactory material could be produced.

Split strips.—The preparation of split strips is simple, requiring, however, practice to do it with dispatch. The spines are removed from the leaves and the strips are split at the cut-off end with a knife. The two surfaces are then pulled apart. The strips are dried as in the case of other pandans.

It is much easier to split the leaves after they have been boiled. This makes the material thinner and for some purposes better. However, the color of the material when dried is not as good as when split fresh.

USES.

Though abundant in all sea-coast provinces, this pandan is not important economically in any locality of the Philippines, though it is occasionally made into hats and mats.

It is very probable, however, that this pandan will be used ultimately in the Philippines to a greater extent and will be found well adapted for the manufacture of a variety of articles.

Samples of fibers and hats received by the Bureau of Education show that the imitation Panama hats exported in large quantities from the Loochoo Islands are probably made of the split strips of this pandan (*Pandanus tectorius*) or one having a leaf very much like it. The bleached pandan fiber is also used by the Japanese in the manufacture of very handsome hand bags.

SABUTAN.

(*Pandanus sabotan*.)

Sabutan (Laguna, Rizal, Tayabas).

Sabutan is a pandan 2 to 4 m. high. Its full-grown leaves, fine in texture, are 2 m. long and 6 cm. wide. It rarely produces flowers and has not yet been found in fruit, although diligent search for the latter has been made for years by interested parties.

Its botanical status is not known absolutely, as fruits have never been collected. It may prove to be only a variety of *Pandanus tectorius*.

DISTRIBUTION.

At present it is found growing in abundance in a semi-wild condition along the eastern shore of Laguna de Bay. It has also been reported growing wild in the forests near Baler, Tayabas. It can be propagated by suckers, and its cultivation can be extended advantageously to any part of the Philippines having moist but well-drained soil.

PREPARATION.

The strips are prepared by removing the spines on the midrib and along the margins. They are then partially dried in the sun and divided into the desired widths by a comblike instrument. By drawing the strips around a board or other object, the water is expelled from the tissue. Then several lengths of pandan strips are rolled up in a bundle and kept in running or standing fresh water for



SABUTAN (*Pandanus sabotan*).

a period not exceeding twenty-four hours. If the strips are put in standing water, the latter is frequently changed. The sabutan strips are then placed in plain water or water to which a little vinegar, lemon, or tamarind fruit has been added and boiled for about fifteen minutes. They are then washed several times in fresh water and spread out in the sun to dry. If the day happens to be rainy, the strips are kept in fresh water and the latter is frequently changed until the sabutan can be put out in the sun.¹

The best strips are prepared during the dry season, for at that time of the year there are many sunny days and better dried and colored material can be obtained.

USES.

If sabutan is not bleached it is light-gray in color. It is the nearest approach to a "Panama straw" found in the Philippines. Hats made of sabutan are strong and well adapted to tropical wear. Sabutan sleeping mats are excellent in quality and the material of which they are made not only takes dye readily but also gives pleasing tones. The straw is excellent for carriage and house cushions. It has also been tried out for tobacco cases and in the knot weave on bamboo framework for hand bags and picture frames. The various new kinds of sabutan articles made in Philippine public schools within recent years are but an indication of the many profitable uses to which the material can be put.

PANDAN OF MAJAYJAY.

(*Pandanus utilisissimus*.)

Pandan Majayjay, Cavinti pandan, pandan totoo, kalaguimay, Luisiana pandan (Laguna). Reported also from Nueva Vizcaya and Tayabas.

The plant attains a height varying between 4 and 6 m. and has leaves fully 5 m. long and 20 cm. wide. Its large fruit appears at first sight to be similar to the jack fruit, but a closer examination makes the difference evident. The whole fruit, about 60 cm. long and 20 cm. wide and many kilos in weight, is made up of drupes.

¹ See Bulletin No. 33, Bureau of Education.

These are exteriorly more or less hexagonal in shape and about 1 cm. in diameter. The outer surface of each drupe is sharply convex, forming a well-marked knob. When the drupes drop from the fruit they show that radially they are tapering and fibrous, and about 6 to 7 cm. long.

DISTRIBUTION.

The species is found in the district north of Mount Banajao, Laguna, including the towns of Majayjay, Luisiana, and Cavinti, and extending into Tayabas Province. Recently specimens of this pandan were collected by the Bureau of Science in Nueva Vizcaya. It seems to grow best in the half shade and is intolerant of stagnant water.

PREPARATION.

After removal of the spines from the leaves in the usual way, the strips are put in the sun and allowed to wilt. Then the strips are rolled under one end of a heavy smooth cylindrical log resting on two pieces of wood. The weight of the log is increased by tying stones or heavy pieces of iron or wood around its center. By a handle attached to its upper surface, the log is rocked to and fro and the strips under it are flattened and made more supple. A further drying of the material in the sun completes the preparation.

USES.

Mats of this pandan are exported weekly by the thousands from Majayjay and Luisiana, Laguna. On coarse mats rice, copra, and similar products are dried, while the finer ones are used for sleeping mats. The weavers in Cavinti, Laguna, confine themselves almost entirely to the manufacture of hats which are cheap and fairly durable and which find a large and ready sale at Pagsanjan and Manila, their principal markets.

Telescope baskets (tampipi), much used by Filipinos for storing clothes and for traveling purposes, are also made of this pandan. The making of doilies, hand bags, wall pockets, picture frames, and slippers in the public schools from the pandan of Majayjay indicate that all its commercial possibilities are not yet fully appreciated.



KARAGUMOY (*Pandanus simplex*).



PANDAN OF MAJAJAY (*Pandanus utilis*).

Many of the better mats and fancy articles are decorated with red buri strips. The use of the latter material is, however, not advisable as it is not strong and wears out long before the pandan shows signs of use.

PANDANS OF MINOR UTILITY.

BARIU.

(*Pandanus copelandii*.)

Bariu, boreo, boreu, buruiu (Albay); baléo, balewe or baliu, balio (Bohol, Capiz, Romblon, Surigao); baleau (Occidental Negros); baloy, baroy (Agusan, Surigao); bareu (Samar); lagutlut (Laguna). Also collected by B. of S. in Benguet, Cagayan, Mindanao, Nueva Ecija, Nueva Vizcaya, Pangasinan, Zambales.

This pandan is widely distributed throughout the Philippines, occurring from Cagayan, Luzon, to southern Mindanao. It is from 3 to 9 m. in height. The leaves are about 2 m. long and 8 cm. wide and are provided with spines along the margins. These spines are coarse and relatively distant near the base of the leaf, but fine and close together near the tip. The fruit forms a cylindric head 7 to 12 cm. long and 5 to 7 cm. across, at first pale yellowish in appearance but soon turning red. From three to five heads occur on the fruit stalk.

TABOAN.

(*Pandanus dubius*.)

Taboan (Surigao); bacong (Bohol). Also reported from Davao, Mindanao.

Brief mention is here made of a rather rare species of pandan (*Pandanus dubius*), so far reported to the Bureau of Education only from Surigao and Bohol. This pandan attains a height of 8 m., has leaves from 2 to 3 m. in length and 20 cm. in width, and drupes 8 to 13 cm. long and 5 to 8 cm. wide.

ALASAS.

(*Pandanus luzonensis*.)

Alasas (Rizal, Zambales); dasa (Rizal); pandan de China (Bulacan).

The pandan known as alasas occurs in Bulacan, Bataan, and other provinces. The leaves of this pandan are narrower than those of *Pandanus tectorius*.

OYAN̄GO.

(Pandanus radicans.)

Oyañgo (Albay); olañgo (Leyte); owañgo (Surigao); wañgo (Bohol); uyañgo (Sorsogon).

Pandanus radicans grows to a height of 8 m. It has long and wide leaves and dark brick-red fruits from 6 to 10 in number, occurring in clusters.

USES.

Though oyañgo is of comparatively wide distribution, it is not of any great importance in any one particular district. It is used for the making of coarse mats, bags, and at times hats. It is very probable that if the leaves of this pandan were properly prepared, articles as good as those from the pandan of Majayjay could be made.

The various plants described as pandans of minor utility are occasionally used for mats and bags.

Chapter IV.—GRASSES.

The vast majority of grasses are herbs—that is, they do not possess woody stems and the whole plant or the parts above the ground die after once flowering. Bamboos,¹ although grasses, have woody stems. As a rule, grasses have hollow stems closed and enlarged at the joints. They never have flowers with showy petals and sepals as there is no need for floral display when the pollen is scattered by the wind and not by insects. The stamens and pistils are borne in the axils of small, scaly bracts called glumes, which are arranged to form spikelets. The fruit is a grain.

VETIVER.

(*Andropogon zizanioides*.)

Vetiver (E.); amora (Cebu, Bohol), anias, anias de moras, ilib (Pampanga); anis de moro (Abra); gueron or guiron (Iloilo); mora (Vis.) (Albay, Antique, Cebu, Iloilo, Occidental Negros); moras (Camarines); moro (Sorsogon); mura (F.); rimodas, tres moras (Capiz). Also known as *A. squarrosus* and *A. muricatus*.

Two varieties of this well-known tropical grass occur in the Philippines. One of these has fragrant roots (var. *genuina*) while the other (var. *nigritanus*) has not. Although intermediate forms exist, the var. *genuina* may be recognized by its terminal, dark-purple panicles and distinct awns on the spikelets. The var. *nigritanus* has terminal greenish or purple panicles, usually the latter, and the spikelets either unawned or armed with short awns.

Farmers sometimes plant the grass on the banks of rivers to prevent washing away of the soil. The plant grows to be from 1 to 2 m. high and continues its growth from root-stocks for a number of years. Arising from the roots are

¹ On account of the great economic importance of the bamboos to the Philippines and because they are different in structure from the ordinary grasses, it is thought advisable to devote a separate chapter to them.

numerous leaves 1 cm. or less in width, longitudinally folded, and about 1 m. high. The grass is found in flower from August to December.

DISTRIBUTION.

In the Philippines, vetiver is found growing wild in open wet lands on banks of rice paddies, ditches, and on dikes.

PREPARATION.

*Stalks.*¹—Straight flower stalks of the proper size are selected and their inflorescence and outer covering are removed. The stalks are then put in boiling water and allowed to boil for about twenty minutes. After taking them out of the water they are dried in the sun for two or three days. Each stalk is then scraped with a sharp knife until it is smooth and clean. They are then cut into the lengths required for hat making or for other purposes.

Roots.—The roots are prepared for use by dipping them in water for about twenty minutes and then pounding them lightly with a wooden club to remove their epidermis.

USES.

Stalks.—In the Philippines the flower stalks are used for hats, but the industry is not of importance in any district in the Islands. The method given in the Albay Division Circular No. 71, series 1910, for making cogon hats may also be applied to the manufacture of vetiver hats. It consists in winding two straws around and around in ever enlarging circles in the shape of a phonograph (flat) record, to form the top or crown of the hat. New stalks are introduced when necessary. These stalks are held in place by passing a double thread² (one from above and one from below) over and under each of these two fibers. The sides are then begun by running the double fibers around until the sides are as high as it is desired to have the crown. The sides are held in place in the same way as the crown. The brim is made like the top of the crown.

¹ From a report to the Director of Education by Mr. L. D. Gregg, supervising teacher of the district of Silay-Saravia, Occidental Negros.

² The use of white thread No. 20 is recommended. About 20 of these threads 1 m. long are needed for a hat.



VETIVER (*Andropogon zizanioides*) WITH LEAVES LONGITUDINALLY FOLDED.

Roots.—The roots should be pressed before being woven into fans. Because of their agreeable odor, the roots of the cultivated vetiver grass are preferred for fans to those of the wild variety.

Sundries.—The fragrant vetiver roots are often put in trunks containing clothing to scent them as would sachet powder. The plant is occasionally employed in the Philippines, as is cogon grass, for cheap roofing and brooms.

Oil is extracted from the roots which is valued at from ₱100 to ₱200 per kilo, depending on the quality.

In India, the roots are used for screens and mats.

AMORES SECOS.

(*Andropogon aciculatus*.)

Amores secos (Capiz, Cebu, Iloilo, Occidental Negros, Pampanga); bariri, dalokot (Iloilo).

It is not difficult to find this grass, as its spikelets adhere to clothing as one brushes past it. The grass has creeping and branching stems which are densely leafy. The flower stems, however, are erect and wiry and from 20 to 50 cm. high. The leaves are short, being but 3 to 10 cm. long, and few in number on the flowering stem. The plants have purplish flower clusters (panicles) composed of bearded spikes. Barbed awns are found on the secondary spikes (spikelets). The grass is widely distributed throughout the Philippines and occurs in open grasslands and waste places. It flowers from May to December.

BELING.

(*Andropogon intermedius*.)

Beling, biling (Cebu).

A few differences between this grass and amores secos, which it somewhat resembles, are here noted. The leaves are longer, but of about the same width. The panicles, though also purplish, are generally longer and compound. The awns on the spikelets are very slender and nearly 1.5 cm. long. They do not adhere to clothing. The plant is widely distributed throughout the Philippines and has the same habitat as amores secos. It flowers from July to November.

BATAD-BATADAN.*(Andropogon halepensis.)*

This tall, coarse, perennial grass, reaching a height of 3 m., has leaves 1 m. long and 1.5 to 4.5 cm. wide. The panicles are from 20 to 40 cm. long. Its spikelets are numerous, hairy, about 4 mm. long, awnless, and greenish or purplish in color. The plant is found along the banks of streams, in damp places, and in thickets.

PREPARATION.

Stalks.—Ordinarily the flower stalks of the various species of *Andropogon* are merely dried in the sun. A better material will result if they are treated as described for vetiver stalks. The stalks are used occasionally for hats.

JOB'S-TEARS.*(Coix lachryma-jobi.)*

Job's-tears (E.); abukay (Il.); adlay, bintikay, burobayoco, pintaka, tigbikay (Albay, Sorsogon); aglay (Misamis); alimodias, poyas (Occidental Negros); balantakan (Pampanga); coldasan (Camarines); dumao, panas, pintaka (Cebu); katigbi (Bohol); tigbi (T.).

This plant is well known and is widely distributed. Two varieties are recognized; one produces a soft-shelled fruit with edible seeds, the other a hard-shelled fruit.

The hard-shelled variety will be described a little more in detail, although, strictly speaking, it is not a fiber plant.

The stem is coarse and from 1 to 2 m. high. The flower spikes are 6 to 10 cm. long. A very hard shining capsule, ovoid in form, white or nearly black in color, surrounds the female flower and grain.

USES.

Seeds.—The soft-shelled variety is made into wine or sometimes employed for various culinary purposes; the hard-shelled seeds may be considered of industrial importance as the beads are sometimes used for rosaries, or made into curtains, baskets, and trays of various kinds and forms.

COGON.

(*Imperata cylindrica* var. *koenigii*; *I. exaltata*.)

Cogon (Sp.), (Camarines, Antique, Cebu, Iloilo, Pampanga); cun (Gad. in Nueva Vizcaya); gyun (Isi. in Nueva Vizcaya); mimi (Iban. in Isabela); panac (Il. in Isabela); panao (Il.), (Il. in Nueva Vizcaya).

Cogon grass with its silky-white panicles is well known throughout the Islands, as it is a weed that roots easily in fallow land and is then extremely hard to eradicate. One variety¹ is usually much less than 1 m. high, while the other² grows from 1 to 1.5 m. in height.

PREPARATION.

The flower stalks may be prepared as a hat material in the same way as those of vetiver grass.

USES.

The flower stalks are used occasionally for hats similar in manufacture to those made of vetiver stalks. The leaves are used at times for roofs and for rope. The Albay schools at the carnival of 1913 showed a round braided mat of cogon which is well adapted for a bathroom mat and for places where a cheap but substantial mat is desired.

COBBOOT.

(*Ischaemum angustifolium*.)

Cobboot (Cagayan, Nueva Vizcaya, Pangasinan, Ilocos Norte); puenig (Ig. in Bontoc).

The base of the stem of this grass is swollen and woolly and so furnishes an important means of identifying the plant. The stem, varying in height between 60 and 90 cm., is smooth and slender, grooved on one side and bears but few branches. The leaves are 30 to 60 cm. long, 3 to 5 mm. in width, either concave or convoluted, and rough along the margins. In Ilocos Norte the grass is considered to reach its full growth during the months of August and September.

The flower spikes are soft and downy, erect, either close

¹ *Imperata cylindrica* var. *koenigii*.

² *Imperata exaltata*.

together or apart, 2 to 5 cm. long, and of golden or rusty color.

DISTRIBUTION.

The plant grows on open, dry, grassy slopes and is found in the Philippines only in northern Luzon.

PREPARATION.

Straw.¹—For slippers, the lower portion of the stalk, about 30 cm. long, is used. Its preparation consists simply in drying the stalks in the sun. It is advisable to keep the straw to be twisted or woven soft and moist by wrapping it in banana petioles. The material is very strong and is used for both the upper and the under sole of slippers.

Rope.—For rope, the plant is cut at its base and dried in the sun for three days. It may then be twisted.

USES.

The straw and leaves are used in slippers and rope.

BIGAO.

(*Miscanthus sinensis*.)

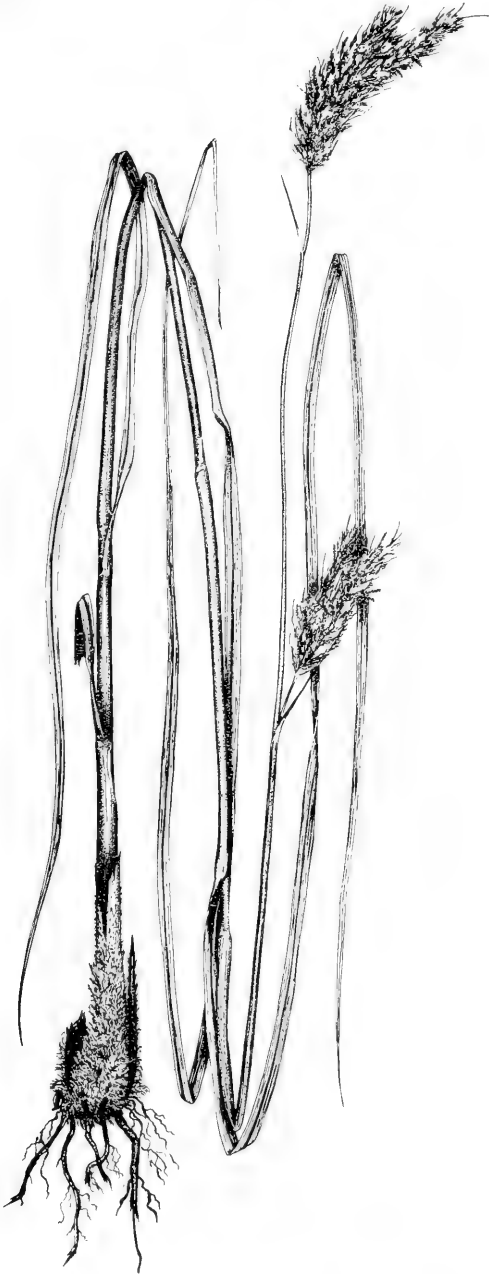
Bigao (Albay, Sorsogon); bigaho, gaho, guisa (Sorsogon).

This is a very tall grass, rather common in the Philippines at medium and higher altitudes. It differs from tambo in that the stalk is not hollow but filled with pith. The leaves, partly ensheathing the stem, are about 70 cm. long, tapering toward the distal third, and between 3 and 5 cm. broad. The panicle is long, feathery in appearance, and made up of a great number of simple, branching spikelets. The plant is in flower from July to October. Its use as an industrial plant has been reported to the Bureau of Education only from Albay and Sorsogon.

PREPARATION.

To prepare the stalks for use, they are dried for a few days in the shade. Only straight stalks of medium growth should be selected.

¹ Information regarding the preparation and uses of cobboot are taken from a report to the Director of Education by Mr. Gil Raval, industrial supervisor of Ilocos Norte.



ISCHAEMUM ANGUSTIFOLIUM.

USES.

The flower stalks of bigao can be used for screens or window shades. The stems are sometimes used for fences and in the mountain districts for making arrows.

RICE.

(*Oryza sativa*.)

Rice (E.).

Although rice is grown throughout the Philippines, very little use is made of the rice straw. The latter is generally burned on the field to enrich the soil.

PREPARATION.

The freshly cut rice straw when bleached in the sun is tough and ready to be used. Old rice straw should not be employed in the manufacture of articles because of its dirty yellow color.

USES.

Slippers.—Within recent years the schools of Ilocos Norte have developed a very neat-appearing slipper by using rice straw for the upper sole and braided maguey for the lower.

Hats.—In Ilocano districts, hats for home use are often made of rice-straw braid. Hat factories in Manila, making foreign-style hats for local trade, have to import the rice-straw braid that they use.

Sometimes, after the rice is threshed, the straws are tied into bundles and used as brooms for rough housework.

TAMBO.

(*Phragmites vulgaris*.)

Tambo (T., B.) (Albay, Bataan, Leyte, Oriental Negros, Rizal, Tayabas); bugang (Bohol); lupi (Camarines); tabunac (Antique, Iloilo); taguisi (Iban. in Isabela); tangbo (Cebu); tanobong (Il.); tantanubong (Il. in Isabela). Found also in Manila and vicinity.

This coarse, erect grass is from 1 to 3.5 m. high. Its leaves are about half a meter long and 3 cm. wide. The panicles are from 30 to 50 cm. in length and made up of numerous slender branches bearing fine spikelets. The whole panicle has a feathery appearance and is brown in

color. Reports from Bataan, where the grass is much used in the manufacture of brooms, state that tambo is easily propagated from rootstocks. Where the soil is inclined to be damp tambo is sometimes found among cogon, and may eventually drive it out if favored by other conditions.

DISTRIBUTION.

The grass is widely distributed in the Philippines, being found on damp ground along streams or other waterways. In the vicinity of Manila, tambo is found in great abundance along the banks of the Pasig River, especially near its source.

PREPARATION.

Tambo is in flower from about August to November or December. Its seeds are carried away by the wind and the bare panicles are left. These are then ready to be used after a thorough drying.

USES.

Brooms.—In Bataan the use of the panicles for brooms is an important industry. For handles bamboo is generally used as core or foundation and the flower stalks of tambo serve as the outer covering. The stalks are held in place by the use of rattan. The handles are usually decorated with nito.

The brooms are well adapted for sweeping the hardwood floors found in many houses in the Philippines. They are exported from Bataan Province in quantity and find a ready sale in other provinces. It is a common sight to see these brooms sold by intinerant venders on the streets of Manila.

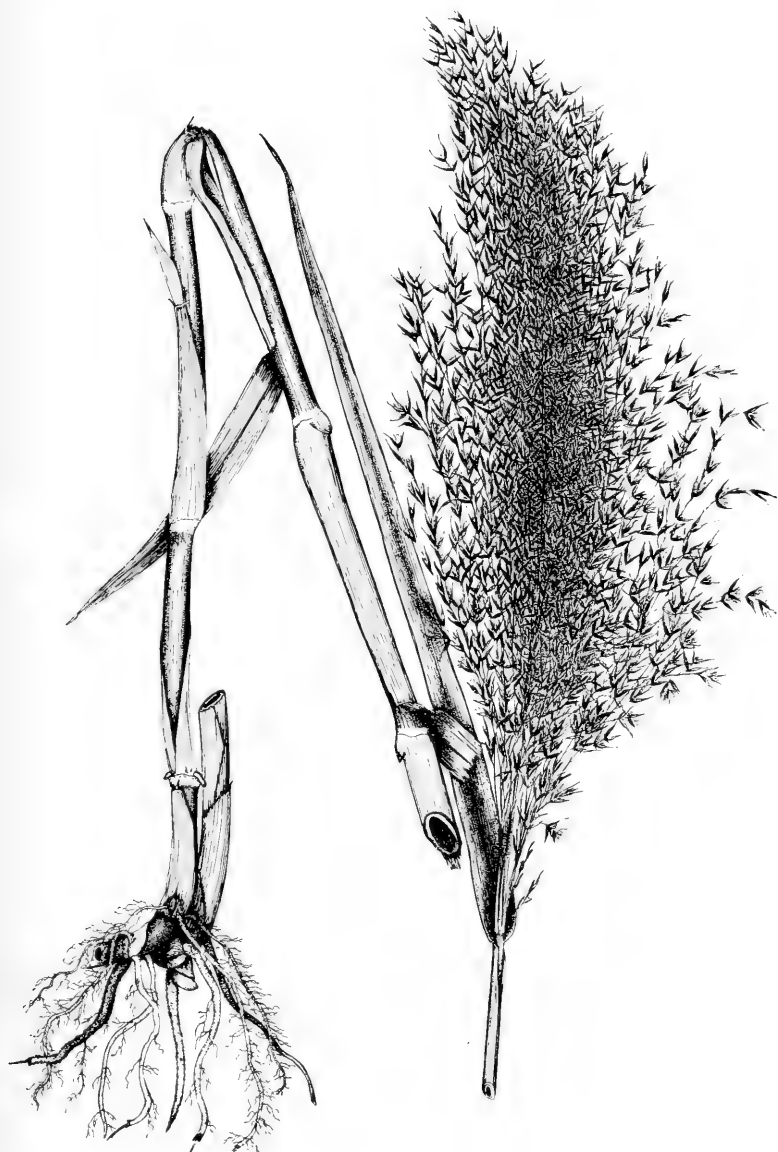
Miscellaneous.—In Bohol the flower stalks are used for making hats, which are coarse but cool and satisfactory for wear around the farm. In Iloilo they occasionally serve the same purpose. The flower stalks can also be made into screens.

SUGAR CANE.

(*Saccharum officinarum*.)

Sugar cane (E.).

The flowering stalk of the sugar cane, called "bilajo" in the Visayas, is sometimes used for picture frames. The material requires no special preparation. The flower stalk



PHRAGMITES VULGARIS.

is cut from the cane stalk and split into strips of the desired width. These are carefully scraped with a knife to remove all hairs or fuzz.

A geometrical design is then drawn and cut from a card or bristol board. The latter is then covered with glue or paste and the splints of the material are fastened to it and allowed to dry.¹

TALAHIB.

(*Saccharum spontaneum*.)

Talahib (Albay, Isabela, Sorsogon, Tayabas, Zambales); bugang (Bohol); sidda (Il. in Zambales); sikal (Isabela); tigbao (Antique, Occidental Negros, Iloilo).

Although talahib grows to about the same height as tambo, leaves and panicles easily distinguish it from the latter. In talahib, the leaves are very harsh, long, and narrow; the panicle is white, generally not as long as in tambo, and consists of fine, fragile branches bearing spikelets supplied at the base with numerous soft, silky hairs.

It has two flowering seasons—one extending from September to November, the other from April to June.

DISTRIBUTION.

The plant inhabits open waste places and fallow lands and is of common occurrence in the Philippines.

USES.

Albay, Sorsogon, and Tayabas report this grass as being used for brooms; in Capiz, the flower stalks are utilized for hats; in Antique, the panicles are used for stuffing pillows and the stems for temporary fences. In Zambales Province the plant is employed by the hill people for arrows, roofing, and walls of houses. In Oriental Negros the flower stalks are used in making picture frames, screens, and wall pockets.

BACUIT.

(*Sporobolus elongatus*.)

Bacuit, banquit (Iloilo). Also *S. indicus*.

The specimens of this grass in the industrial museum of the Bureau of Education show that the plant has slender

¹ From a report to the Director of Education by Mrs. Emilia Jara, principal, La Paz Primary School, Iloilo.

stems and numerous rather long but narrow leaves at the base. The panicles generally do not exceed 40 cm. in length. They are of pale green or speckled black and straw color and consist of simple ascending spikes having awnless spikelets.

USES.

Hats.—Fairly fine straws of medium length are obtained from the flower stalks and utilized at times in Iloilo Province as a hat material. The retail price of these hats varies from ₱1.60 to ₱2.50.

TIGER GRASS.

(*Thysanolaena maxima*.)

Tiger grass (E.); buibui (Il.); bugubui (Negrito in Pampanga); lasa (Bataan); tagadeu (Bontoc). Collected also by B. of S. in Bulacan, Mindoro, Occidental Negros, Rizal.

This grass, found along the steep sides of mountains or near their summit in Bataan, grows practically at sea level in Rizal (Montalban). It is identical with the grass known in India as tiger grass. The plant has a tall and solid stem. Its long panicles consist of numerous fine slender branches having very fine and delicate flowers and seeds.

PREPARATION.

No other preparation outside of drying the panicles and the removal of their fine seeds by pounding is necessary.

USES.

Brooms.—This grass is used for the best grade of Philippine brooms. It is not as soft as tambo, but will wear better. On account of its good wearing qualities and because the material is less plentiful and harder to obtain than tambo, tiger-grass or lasa brooms, as they are more commonly known in the Philippines, are sold at a higher price than tambo brooms.

The panicles are also made into brushes used for white-washing.

GRASSES RARELY USED.

There are a number of species of grasses in the Philippines that are occasionally employed in the making of hats. Sometimes a farmer, to satisfy a particular fancy or whim,



THYSANOLAENA MAXIMA.



will select the flower stalks of some grasses¹ and make them into a hat for himself or some member of his family. They never, or at least very seldom, enter even local trade.

Filipinos sometimes use grasses² with light feathery tops as wall ornaments, or put these grasses in vases for decorative purposes.

¹ Calamutian (*Apluda mutica*): Calamutian (Pampanga); may-cauyan (Samar).

Palagtiqui (*Eleusine indica*): Palagtiqui (Occidental Negros); gagabutan (Tarlac); sabung-sabungan (Pampanga).

Sigburon (*Ophiurus corymbosus*): Sigburon (Camarines).

² Sale ayup (*Eragrostis tenella*): Sale ayup (Pampanga).

Pugad maya (*Eragrostis viscosa*): Pugad maya (Cavite).

Chapter V.—THE BAMBOOS.¹

Bamboos are found in all tropical and subtropical regions of the world, especially in those of Asia, including Polynesia, and South America. They are entirely absent from Europe, except as introduced and cultivated forms.

The stems or culms of bamboos are cylindric, generally hollow, and separated by partitions into joints. These partitions are known as nodes, the parts between them as internodes. The thickness of the culms and the length of the internodes vary greatly in different species.

New stems are generally developed at the beginning of the rainy season. Cloudy days, however, are said to retard the growth of the culms. The young shoots grow very rapidly and reach their full growth in height and thickness in less than a year. After full height is attained, the stem develops branches and branchlets, and in most species the plant assumes a feathery appearance. The culms are not considered mature until their branches are fully formed. The number of shoots produced yearly from each clump of bamboo varies with the vigor of the individual and the habits of the species. In India, the mean age of most species of bamboo is considered to be 30 years; the larger species producing 12 to 20 culms annually and the smaller ones 30 to 50 culms. It is believed that in the Philippines

¹ It will not always be feasible to treat in this bulletin each species of bamboo in detail, as the general appearance of many species is so strikingly similar that the basis for differentiating one from another rests mainly, or sometimes entirely, on peculiarities in the structure and appearance of the flower. Unfortunately, many species are rarely seen in flower, which adds to the difficulty of distinguishing the species.

The description of bamboos in this bulletin is based chiefly on the following publications: J. S. Gamble: *The Bambuseae of British India*. *Philippine Journal of Science*, Sec. C., September, 1910: *The Bamboos of the Philippines*. Sir G. Watt: *The Commercial Products of India*.

bamboo grows for an indefinite period of time and that the number of culms produced yearly is as great or even greater.

Some species of bamboo have large leaves and others small ones, but variation in the size of the leaves may occur in the same clump and species of bamboo. Neither size, shape, nor the number of veins in the leaf can be taken as invariable characteristics of the species.

Many species of bamboo flower once and then die. Some flower only after a great interval of time. The flowers usually appear only after the bamboo is in full leaf, and in the majority of cases, the leaves drop off as the inflorescence continues to form. The flowers may cover the branches or only the branchlets; they may be crowded into a head or scattered and distant; they may be few or very numerous. Sometimes the clumps of the same species of bamboo in a locality flower at one time, seed, and then die.

The bamboo belongs to the family of grasses and its fruit is a grain.

SPINY BAMBOO.¹

(*Bambusa blumeana*.)

Spiny bamboo (E.); aono-o (Capiz); baguin (Pampanga); batakan (Surigao); bayug (Gad. and Il. in Nueva Vizcaya); bayog (Il. in Zambales); caña espina (Sp.); duguian, kabugaoan, marurugui, ruguian (Albay, Sorsogon); kawayan (T., B.) (Antique, Bataan, Bohol, Bulacan, Cavite, Cebu, Mindoro, Occidental Negros, Pampanga, Rizal, Sorsogon, Surigao, Tarlac, Zamboanga); kawayan guid, paua (Iloilo); kawayan matinic (Laguna, Tayabas); kawayan ñga bulilao (Occidental Negros); kawayan seitán (Union); kawayan totoo (T.); pasingan (Cagayan).

The stems or culms of this bamboo are from 10 to 20 m. high and have a diameter of about 8 to 10 cm. The basal portion of the plant is surrounded by stiff, interlacing, spiny branches. It is the only species of bamboo in the Philippines provided with spines and it is therefore easily recognized.

DISTRIBUTION.

The most common bamboo in the Philippines and found throughout the settled portions of the Archipelago.

¹ See frontispiece.

PREPARATION.

*Splints.*¹—The preliminary work in the manufacture of bamboo splints is done by the men. The bamboo, after being felled (the bamboo stem is felled when it is from 4 to 5 months old and before it has developed any branches), is allowed to wither in the shade for from three to five days, and is cut up into sections at the node with a bolo or saw. The nodes are trimmed off. Since the sections toward the bottom would produce too short and those at the top too weak material, the middle sections only (from 10 to 20 in number) can be used. Each section is split into three or more pieces and the inner part is removed with a short, sharp, stubby knife until there remains but about one-eighth of the original thickness, including the green outer skin. The material split away cannot be used, since the splints obtained from it would be too coarse and weak. The stripper must be expert enough to know when he has obtained the proper thickness. The remaining splint of bamboo is flattened by placing one end on a bench and forcing the rest down flat so as to remove the curve. The stripper then cuts two lines across near the top, one deeper than the other, but not through the material, and pries and pulls the bamboo into three layers (*lapat*), each of which can be again reduced to thinner layers in the same manner, so that from four to ten layers, besides the green outer skin (*balat*), can be obtained, though the usual number is five or six, and it is very seldom that more than eight are produced. (The best and finest splints are obtained from the bamboo layers nearest the green epidermis.) The material is then boiled in water for about half an hour and bleached in the sun—a strengthening and whitening process.

*Basket splints.*²—Deep-green culms should be used. If, on scraping away the epidermis with a knife, the exposed layers are slightly dark or brown in color, the material is too old and hard to be used for baskets.

¹ Bulletin No. 33, Bureau of Education.

² Albay Industrial Bulletin No. 4.



BASAL PORTION OF *BAMBUSA BLUMEANA* IS SURROUNDED BY A NETWORK OF STIFF, SPINY BRANCHES.

Sawali.¹—For making sawali, the whole culm is split into four parts. These are then divided again radially into pieces as great as the desired width of sawali. The pieces are then cleaned and split tangentially into strips of the required thickness. Several species of bamboo besides *B. blumeana* are used in the manufacture of sawali.

Roots.²—The fine roots of bamboo make excellent material for baskets. The roots used should be green, as the dead roots are black and worthless for basketry. The small knots upon the roots are easily removed by scraping the roots with a knife. Care should be taken not to scrape too deep, as it spoils the natural polish. Rub them with sand paper and halve them for making the bottoms of any basket. Be sure that the outer layer is removed, as it turns dark with age. If properly prepared, the bottom of the basket will be fine and glossy.

Culms for house construction.—If strong and durable bamboo is desired, only mature stems with branches fully developed should be used. The best time for felling bamboo is said to be when the "sap is down," between November and the latter part of January in most parts of the Islands. If cut during the rainy season, it seems to fall an easy prey to weevils, "bucbuc" in Tagalog. Filipinos say that bamboo cut in the rainy season should be thoroughly soaked in salt water to prevent insect attacks. This statement is corroborated by Sir G. Watt, who says:

Long immersion in water greatly enhances the durability (of bamboo), rendering the stem less liable to the attacks of insects, owing to the sap, which they are fond of, being quickly extracted.

USES.

B. blumeana furnishes the material for the bamboo hats made in Baliuag and Pulilan, Bulacan. In Isabela and other provinces this and other species of bamboo are employed for hat manufacture. The important part played by this bamboo in the building of houses and fences, in

¹ Sawali is a term commonly used in the Philippines for spliced bamboo that is woven into rolls about 2.5 m. wide and from 9 to 15 m. long. It is used for ceilings and partitions in houses.

² Division Memorandum No. 8, s. 1912, of Occidental Negros.

the construction of furniture, in the manufacture of baskets, fans, and tobacco cases, and in the making of ceilings and floors is too well known to need further comment.

DWARFED BAMBOO.

(*Bambusa glaucescens*.)

Dwarfed bamboo (E.); Japanese bamboo, Chinese bamboo (E.).

This is a small, dwarfed, shrubby species of bamboo from 1 to 3 m. high and with stems 1 to 2 cm. in diameter. It is often cultivated in Manila as a hedge plant. It may be used for bobbins.

KAWAYAN KILING.

(*Bambusa vulgaris*.)

Kawayan kiling (T.) (Bulacan, Cavite; Il. and Zambal in Zambales, Nueva Ecija, Nueva Vizcaya, Tarlac, Union); bolinao (Iloilo); borirao (Antique); butong (Albay, Capiz); kaboloan (Albay); kawayan bayuguin (T.) (Nueva Ecija); kawayan hobero (Laguna); kawayan ñga dalusa (Occidental Negros); lunas (Bohol, Cebu, Leyte); sinambang, kawayan sa China (Cebu); taywanac (Cavite).

This bamboo is a large arborescent shrub. It has a bright-green stem, shiny and polished in appearance. The plant attains a height of 17 m. and a diameter of 15 cm. It bears no spines. If closely examined, a very minute earlike projection can be seen at the apex of the leaf sheath near the base of the petiole. The leaves may be as much as 35 cm. long and 4 cm. wide.

DISTRIBUTION.

This species is found in thickets and is widely distributed throughout the Philippines.

USES.

B. vulgaris is a strong bamboo used in house construction, for bridges, furniture, and other purposes. In India it is used in basketry.

YELLOW BAMBOO.

(*Bambusa vulgaris* var. *striata*.)

Yellow bamboo (E.).

This species is easily recognized by its bright-yellow stem often striped with green. The stem grows to be about 12 m. high and about 5 to 6 cm. in diameter. The internodes



BAMBUSA VULGARIS VAR. STRIATA.

are 20 to 25 cm. long. The leaves are about 20 cm. long and 1.5 to 4 cm. wide. The species is widely distributed. It is occasionally cultivated in Manila for ornamental purposes.

BOTONG.

(*Dendrocalamus latiflorus*.)

Botong (Albay, Camarines, Cebu); bolongsina (Camarines); butun (Cebu); kaboloan (Albay, Sorsogon); patong (Sorsogon, Surigao).

The stem of this bamboo is tall and hollow throughout and about 12 cm. in diameter. Its inner cavity is very large; internodes short. The leaves of this species are about 15 to 20 cm. long and 2 to 5 cm. broad and smooth to the touch. All species belonging to this order are arborescent, unarmed bamboos, with densely branching root-stocks and leaves shortly petioled.

USES.

It is used for walls and floors of houses. It is not considered a good material for baskets.

ZIGZAG BAMBOO.

(*Dinochloa scandens*.)

Zigzag bamboo (E.); balukawi (Cebu, Mindoro); bukao (Basilan); timak (Mindoro). *D. scandens* var. *angustifolia*.

This species of bamboo is widely distributed in the southern islands. The characteristic of the genus is its climbing zigzag-geniculate (abruptly bent so as to resemble a knee joint) culm. The species is an evergreen, with stems attaining a height of 30 m. and a diameter of 2.5 cm. The sheaths on the culm are cylindric and sprinkled with white fugacious bristles. The bases of the culm sheaths are persistent and leathery.

The nodes of the stem are swollen and marked by leathery persistent bases of the fallen leaf sheaths. The thin-walled internodes are from 20 to 45 cm. long and hairy in the upper part. Leaves are moderately large, 10 to 20 cm. long, 2 to 4 cm. broad, and lanceolate in form. The bases of

the leaves are prolonged into short, hairy petioles. Specimens of this bamboo have been received at the General Office, Bureau of Education, but its uses have not been reported.

BOLO.

(*Gigantochloa scribneriana*.)

Bolo, boco, botong (Capiz); botong (Bohol); kawayan de China (Bulacan).

This bamboo is tall and erect. Its stem sheaths are usually stiff, auricled, and hairy above. The leaves are rather lanceolate in shape, from 25 to 30 cm. long and 3 to 3.5 cm. wide. Its distinguishing features lie mainly in the structure of the flower. It is used for fish traps, for carrying water, and other purposes.

THIN-WALLED BAMBOO.

(*Schizostachyum* spp.)

The species belonging to the genus *Schizostachyum* are arborescent or shrubby bamboos, usually erect, sometimes climbing. The culms are smooth, generally slender, walls thin. The culm sheaths are shorter than the internodes. The leaves are broad and borne on petioles.

It is rather difficult to separate the various species of *Schizostachyum*, as the distinguishing features are more apparent in the flower than in the other parts of the plant.

BIKAL.

(*Schizostachyum acutiflorum*.)

A climbing bamboo. Bikal (Abra, Il., Pang. in Pangasinan, Pampanga); baliaro, balicao (Iloilo); bongbong (Bohol, Cebu); hindi, indi, inri (Albay, Sorsogon); guimac (Bataan); lilit (Negrito in Pampanga).

The species of bamboo, called *S. acutiflorum*, has leaves that are usually broad and rounded at the base. Fine hairs occur where the leaf joins the stem. This is a favorite bamboo for baskets.

BIKAL BABI.*(Schizostachyum dielsianum.)*

A climbing bamboo. Bikal babi (Pampanga); bikal (Cagayan, Union); bikal baboy (Zambales); bikal machui (Baluga in Pampanga); lo-ob (Bohol); usio (Cavite, Laguna). This bamboo has also been reported from Tarlac and Batangas.

This bamboo has leaves that are usually narrow and attenuated at the base. This species is never or only slightly bristly where the leaf joins the stem. The culms of this bamboo are used in Cavite and Cagayan for making chairs. Though it also occurs in other provinces, its value as a furniture-making material does not seem to be fully realized.

PUSER.*(Schizostachyum fenixii.)*

A suberect bamboo. Puser (Il., Abra).

The leaves of this bamboo are from 30 to 35 cm. long and 4 to 5 cm. wide. They are borne on extremely short petioles hardly 3 mm. long. The splints of this bamboo are used in Abra for making baskets; the roots, for handles of fans.

BAGAKAY.*(Schizostachyum hallieri.)*

An erect bamboo. Bagakay (Cebu); anos (Bataan, Cavite, Laguna, Mindoro); bolo (Union).

This bamboo has culms 8 to 9 m. high and from 2 to 4 cm. in diameter. The internodes are about 1 m. long. Leaves are smooth above and hairy below, from 15 to 30 cm. long and from 3 to 7 cm. wide and borne on petioles from 5 to 10 mm. long. It is reported that this bamboo must be boiled before it can be used for fans, cushions, and hats. It is also used for rice-winnowing baskets and for making bobbins for weaving looms.

BAGAKAN.

(*Schizostachyum hirtiflorum.*)

An erect bamboo. Bagakan (Palawan); bulu (Iloilo; Gad. and Il. in Nueva Vizcaya, Palawan, Zambales).

This species has leaves from 12 to 20 cm. long and from 1 cm. to a little over 2 cm. wide. Its stem is 6 to 9 m. high and 7 to 10 cm. in diameter. It can be used for baskets, fish corrals, fences, and various other minor purposes.

BUHO.

(*Schizostachyum mucronatum.*)

An erect bamboo. Buho (Camarines, Cavite); bagakay (Albay, Bohol, Capiz, Iloilo, Leyte, Sorsogon); kawayan sunsong (Laguna); oras (Albay).

A bamboo that is used for fish poles, flutes, fences, sawali, and other purposes is *S. mucronatum*. Its culm grows to be about 12 m. high and is covered with a silicious fuzz. For the latter reason it is not liked as basketry material. The leaves grow to be 16 cm. long and 1 cm. wide.

Chapter VI.—SEDGES AND SIMILAR PLANTS.

Sedges grow in wet ground. They resemble grasses. Apart from important differences in the structure of the flower, perhaps not evident to the casual observer, they can be distinguished from grasses by the usual absence of joints, by the usually triangular solid stem, and by their 3-ranked, not 2-ranked, leaves.

The "cat-tail" and the "matting rush" are plants differing greatly botanically from the sedges. Botanists have therefore placed them in separate families. Because of their superficial resemblance, however, to the sedges and because they occur in similar localities, they are included in this chapter.

BALANGOT.

(*Cyperus malaccensis*.)

Balangot (Bataan, Bulacan, Camarines, Cavite, Cebu, Leyte, Mindoro, Pampanga, Rizal); бага-as (Capiz).

This sedge is a perennial plant and continues sending out new stalks from its underground stems year by year. These stalks are stout, three-sided, and reach a height of 1.5 m. The spikelets are crowded together, very narrow, and from 1 to 2 cm. long. The plant is in flower from July to December.

DISTRIBUTION.

Balangot is found in brackish swamps and along tidal streams not only in the Philippines, but also in tropical Africa, Asia, and islands of Polynesia and Australia.

PREPARATION.

Coarse straw.—During the dry season, because of the many clear, sunny days, a better straw can be produced than during the rainy season. The plants are cut near the ground and for a few days are put out to dry in the

sun. Then generally they are tied into small bundles and kept in the house until wanted.

Fine straw.—Mr. W. Huse Chapman, division industrial supervisor for Pampanga, who has given special attention to balangot straw in connection with its use for slippers, reports to the Director of Education as follows:

Depending on the purposes to which the straw is to be put, just one side of the three-cornered stalk is removed, or, if a very fine straw is desired, the edges are cut off and the sides pulled apart. At the same time, more or less of the pulp is also removed.

Naturally, if but a small amount of pulp is removed, the straw is thick and soft; if a large amount, the straw is thin and fine. The strips are now put in the hot sun for a first quick drying, so that the edges may curl around any bits of pulp left. After this first quick or partial drying the straw is allowed to dry completely in the shade and is ready for use. This method gives a light-green straw.

The straw may be whitened and toughened by keeping it damp in the hot sun for several days. (If the straw is allowed to dry completely in the sun, it becomes brittle.) If the straw cannot be kept damp throughout the day for several days, it may be put out in the evening to be dampened by the dew and allowed to remain in the sun the next morning until about 10 or 11 o'clock, when it should be taken in until night. This process repeated eight or ten times will give a good, white, tough straw.

The completely dried straw will keep without deterioration but must be dampened before being used.

USES.

Slippers.—A very poor grade of balangot slippers is sold in the small shops throughout the Islands—especially in northern Luzon—and also by itinerant venders in the streets of Manila. The chief center for the making of these slippers is the important barrio of San Juan within the jurisdiction of the municipality of Malolos, Bulacan. In this barrio every house, with very few exceptions, is engaged in the making of these slippers. Women and children are the chief workers and apply themselves to this work when they can find time for it from other duties.

The slipper industry was first started in the barrio of San Juan about four or five years ago, so the people say, by two Japanese peddlers who came through the barrio selling small cakes commonly known as "apa." Seeing that



CYPERUS MALACCENSIS.

balangot grew in great profusion in the vicinity of the barrio, they soon gave up selling cakes and began making slippers. Within a few months some Filipinos started making slippers. As there was a ready sale for the product, more and more people began making balangot slippers until now practically the whole barrio is engaged in this industry. The Japanese remained in the barrio for about one year and a half, but finding competition too strong moved away.

A better grade of slippers is now being developed in the public schools. These slippers are neat in appearance and are made of finely twisted split straw. For the inner sole the sheath of the areca palm (bamboo sheath might also be serviceable) is used with a narrow strip of rattan to form the edge.

Hats.—The straw was formerly used quite extensively for cheap hats, but now its use for this purpose is rare and spasmodic. The decline in its use is probably due to the fact that more satisfactory hat materials have been found. There is a large export trade from Japan of horses' sun-bonnets made of sedges. It is very probable that balangot could be utilized for the manufacture of this article.

A good grade of matting can be made from the fine balangot straw. In fact, the sedge resembles closely the Chinese matting sedge (*Cyperus tegetiformis*) which is used extensively in China for the manufacture of matting.

ALINANG.

(*Cyperus radiatus*.)

Alinang (Albay, Cebu, Leyte, Sorsogon); balabalangutan (T.) (Bulacan); malapandan dagko (Oriental Negros); obod-obod (Capiz, Tayabas); upopi (Cagayan).

Alinang is sometimes confused with balangot (*C. malaccensis*) or with agas (*Rynchospora aurea*). Alinang can, however, be distinguished from balangot if the following points are noted: Alinang grows to be 1 m. high; has a number of leaves one-half to two-thirds as long as the stem; a large number of leaflike bracts subtending the inflorescence and spikelets 4 to 5 mm. long. Balangot grows to a height of 1.5 m. and has no leaves or just a few which are less than 3 cm. long. Its spikelets are 1 to 2 cm. long,

and under the inflorescence are from two to five leaflike bracts. (For characteristics of agas, see description under same).

DISTRIBUTION.

Common in wet or swampy places and in flower all the year.

PREPARATION.

The sides of the stalks are carefully stripped off and dried in the sun, or in the shade if it is desired to have them less brittle.

USES.

It is used for mats in Oriental Negros, Capiz, and Cagayan. Albay reports that it may be used for weaving screens or matting on looms.

CHINESE MATTING SEDGE.

(*Cyperus tegetiformis*.)

Brief mention is here made of a sedge cultivated extensively in China for matting. A short time ago rootstocks of this sedge were received by the Bureau of Education from the consul-general at Canton. They were sent to San Luis, Pampanga, and to Los Baños, Laguna. From both places reports have been received stating that the plants are doing fairly well.

Whether the cultivation of the plant in the Philippines is commercially feasible has not yet been definitely determined.

TAYOC-TAYOC.

(*Fimbristylis diphylla*.)

Tayoc-tayoc (Capiz, Iloilo, Occidental Negros, Zambales); tabtabin (Zambales); pauai (Benguet). Collected also by B. of S. in Cagayan, Laguna, Nueva Vizcaya, Rizal, Surigao.

The plant is exceedingly variable. The stem of the sedge is generally shorter and narrower than that of tikug. It is surrounded at the base by a number of very narrow leaves from 10 to 30 cm. long and 1 to 3 mm. wide. The spikelets are about 1 cm. long and reddish-brown in color.

DISTRIBUTION.

The plant is common in open grasslands throughout the Philippines. It also occurs in all warm regions of the world.

PREPARATION.

Tayoc-tayoc is prepared in the same way as tikug, except that after the sedge is gathered from the field it is mixed with ashes. This is said to soften the fiber. Prepared tayoc-tayoc straw, while finer than tikug, is considerably stiffer and shorter than the latter and therefore is not considered as good an industrial fiber.

WORTHLESS TIKUG.

(*Fimbristylis miliacea.*)

Worthless tikug (Samar).

This sedge is often found growing among good tikug (*F. utilis*) in open wet lands and old rice fields. In Samar the plant is considered worthless as it does not produce a serviceable straw. The stalks are from 40 to 60 cm. long, angular, and of a greenish-yellow color. Around the base are leaves often two-thirds as long as the stalks themselves. The spikelets are smaller than those of tikug, being from 2 to 2.5 mm. long and brownish in color.

TIKUG.

(*Fimbristylis utilis.*)

Tikug (Vis.) (Bohol, Cebu, Leyte); anahiwan (Agusan, Moro, Surigao); tayoc-tayoc (Iloilo); muta (Pampanga); sud-sud (Bukidnon). Collected by B. of S. in Laguna and Tayabas. Also *Fimbristylis globulosa*.

The sedge tikug sometimes attains a height of 3 m., but the average is $1\frac{1}{2}$ m. The tufted stems are shiny, smooth in appearance, and about 4 mm. in diameter. They may have long leaves at the base or may be entirely leafless and are usually four to five sided immediately under the inflorescence. A cross section of the stem shows the latter to be oval in form.

The many flowers of tikug borne on small branching stalks are clustered into spikelets, fuzzy and dusky brown in color,

and but a few millimeters in length. The axis of the spikelets (rachis), as is usual with all species belonging to the genus *Fimbristylis*, remains attached to the stem long after the wind has blown away the seeds.

Through experiments conducted by Mr. John F. Minier of the Bureau of Education, it was found that by sowing tikug seeds very closely on richly manured and well-watered soil, so that about 5,000 stalks grew on a square foot of ground, very fine long straws were produced.

DISTRIBUTION.

Tikug grows wild and in great abundance in marshy places and in and around rice paddies in parts of the Visayas and Mindanao. It reaches its greatest economic importance in a number of districts in Samar, Leyte, Mindanao, and Bohol.

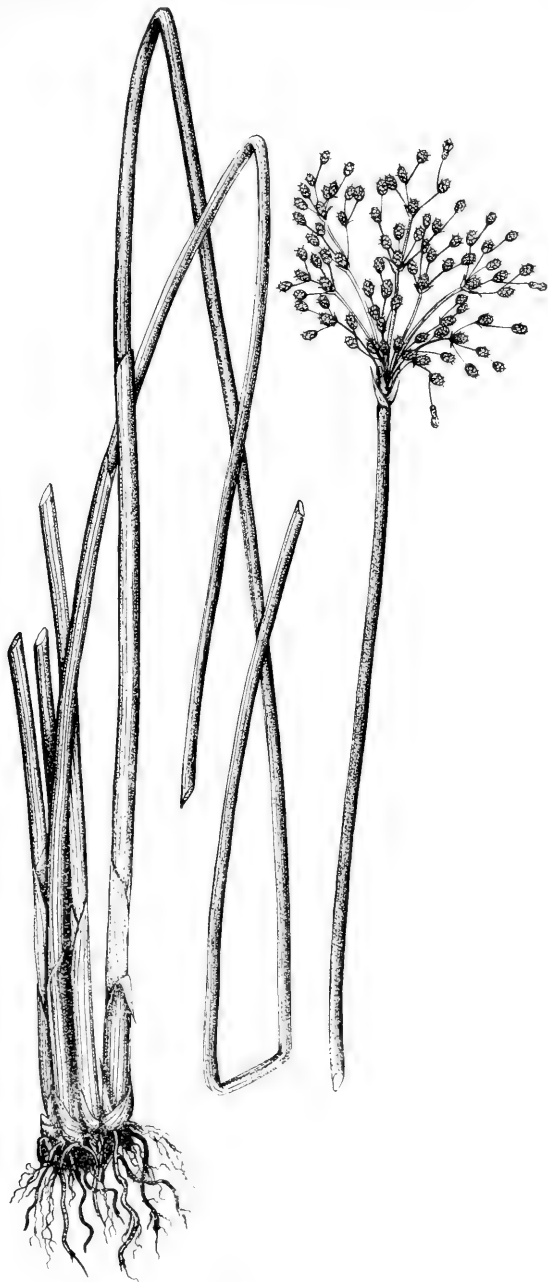
PREPARATION.

Drying the straw.—The preparation of tikug for industrial purposes is very simple, consisting chiefly in keeping it away from dew, moisture, and water while the drying and bleaching of the straw in the sun is accomplished. This generally takes from seven to ten days. If the straws become damp or wet from dew or rain, they will mildew and turn an unsightly black or brown. Boiling the straw ten or twenty minutes before drying tends to improve the color.

Tikug straws will keep for a long time, but in the dry season they should be frequently exposed to the sun and during the rainy season they should be wrapped in a blanket or a piece of cloth. For plain mats the whole straw is used, but for the embroidered part split straws are employed.

*Flattening the straws.*¹—The straws composing the bleached or dyed bundles of material are stiff and uneven; some are bent and others are round. The process of flattening them and making them more pliable is carried on during damp days, in the morning or evening, for if done in the open air on cloudless days, or at any time when the atmos-

¹ THE PHILIPPINE CRAFTSMAN, Vol. I, No. 4, p. 312.



FIMBRISTYLIS UTILIS.

phere is dry, the straw becomes brittle and breaks. However, climatic conditions may be overcome by wrapping the straw in banana leaves or damp cloth for an hour or more and then working it where no breeze can dry it out. No water should be applied. The workers employ the usual blunt-edged, rulerlike piece of wood; between this and the thumb the straw is drawn by the free hand. This process flattens the straw and makes it pliable so that it does not split during weaving.

The best time for working up the straw is early in the morning or late in the evening and at all times on cloudy and rainy days. In dry weather the straw becomes very brittle. It is also well to cover unfinished work for the night with a damp cloth.

USES.

Mats.—The mats made from tikug straw are superior to the buri mats in wearing qualities, equal to the average sabutan mat, but inferior to the very finest mat product of the sabutan plant. Tikug mats are usually colored and often have a soft, rich tone due to the gloss and pliability of the straw and the readiness with which it responds to dye treatment. It is easy to work patterns and designs of various kinds and colors into the mat. The designs published in connection with the article on Philippine Mats in the *THE PHILIPPINE CRAFTSMAN*, Volume I, No. 5, and the suggestion given on the use of colors in mats in the same publication in Volume I, No. 3, will be found helpful in the designing and coloring of tikug mats.¹

The ordinary tikug mats are more or less rectangular in shape and used by Filipinos as sleeping mats or at times by Americans for wall decorations. Recently, the people in Samar started the making of round mats which are intended to be put on the floor under the table or other furniture. The schools also employ tikug straw for doilies.

At the first Philippine exposition in Manila in 1912, the Bureau of Education exhibited a Japanese matting loom which had been greatly improved at the Philippine Normal

¹ See also *THE PHILIPPINE CRAFTSMAN* Reprint Series, No. I. "Philippine Mats," Bureau of Education, 1913.

School at Manila and which is well adapted to the making of tikug matting. Since then similar looms have been constructed and sent out to various provinces. Tikug mattings woven on these looms are somewhat stiff but of good appearance and will probably wear as well as the average foreign matting.

At present tikug hats are of local importance in some localities in the Visayas. They serve well as cheap farm hats and if made in large quantities should find a ready export sale.

Tikug cushions of various kinds for the home and for carriages have been made in the public schools. It is a mistake, however, to try to make them with a plush border in imitation of Japanese carriage cushions, as velvet looks incongruous with tikug straw. A plain tikug border would not only be cheaper, but greatly improve the appearance of the cushions. As with mats, very pretty color and designing effects can be secured on the cushions.

Among the minor articles made from tikug are tobacco cases of various kinds.

Tikug slippers are made in a number of places and sold locally. They are, however, not very satisfactory as they wear out too soon.

MATting RUSH.

(*Juncus effusus*.)

This rush, which is cultivated by the Japanese for their finest mats, is found growing wild in the Philippines in marshes at an altitude of 4,500 feet or more. It is therefore found in the highlands of the Mountain Province and on some Mindanao mountains.

The round stalks of the plant, a meter or more in height, arise from rootstocks, which, as they continue their growth, send out new stalks. The base of these stalks is surrounded by short sheathing leaves brownish-red in color, while several centimeters from their tip arise a number of small unbranched or branched flower stalks. These bear small flowers not arranged in spikelets. The small, yellow seeds occur in brownish capsules whose walls ultimately divide into three parts.



JUNCUS EFFUSUS.

The mountain people have found no use for this rush, although it grows in abundance in various parts of their province. The matting rush cultivated in Japan is said to be very much finer than the one found wild in the Philippines. It is reasonable to suppose that such is the case, as cultivation in seed beds and close planting in well-fertilized fields is bound to produce a finer straw than that which is obtained from wild and spontaneous rushes growing in swamps without care and attention.

The production of a finer straw from this plant through cultivation is an experiment well worth trying in the Mountain Province. The cultivation of the rush is much like that of rice, except that the rush is perennial and lives many years.

Experiments conducted at Baguio show that a fine straw can be prepared from the coarse stalks by splitting them, removing the pulp and drying the straws quickly in the sun so as to cause them to curl up. Then they may be dried further as is done with balangot and split pandan leaves.

Flat straws can be produced by removing the pulp and flattening the stalks by drawing them between the thumb and a flat piece of wood.

AGAS.

(*Rynchospora aurea.*)

Agas (Albay, Cebu, Leyte, Sorsogon); bariu-bariu, raguidiu (Albay, Sorsogon); piso piso (Sorsogon); raguidio, raguio, rakeydo (Camarines); tikiu (Laguna).

This sedge is found in all warm regions of the world. It has so far been reported to the Bureau of Education from Sorsogon, Albay, Camarines, Laguna, Leyte, and Cebu. It is found, however, in all provinces and all larger islands of the Philippines. It is about a meter high; its stem is distinctly triangular and the leaves surrounding the stem are long and broad. The panicle is long and wide and made up of comparatively long, spreading, branching spikes bearing spindle-shaped, awnless spikelets, which are rich brown in color and about 8 mm. long.

DISTRIBUTION.

It is found in wet or swampy land and will often grow in rice paddies after the rice harvest.

PREPARATION.

The Albay Industrial Bulletin No. 4, of December, 1911, gives this information on the preparation of the sedge:

The stalk is dried in the shade for a few days before using. For making screens, it is best to cut it into strips of as uniform width as possible. For making sleeping mats, one of the sides of the stalk is cut or stripped off. For making ordinary baskets the whole stalk is used, one of the sides of the stalk being pressed or flattened down upon one of the other two. For making raffia coiled baskets, this sedge may be used in place of rattan (for foundation).

USES.

The sedge is sometimes used in the Bicol Provinces for sleeping mats, sandals, baskets, and screens.

SCIRPUS spp.

TICOG.

(*Scirpus erectus*.)

Ticog, tayoc-tayoc (Occidental Negros).

Scirpus erectus has spikelets, solitary or from three to five in number, occurring laterally several centimeters from the top of the stalk. The spikelets, as a rule, are smaller and the whole stem is shorter, narrower, and much finer than that of biluan (*S. mucronatus*). The plant grows in wet lands throughout the Philippines and flowers more or less during the whole year.

TIQUIO.

(*Scirpus grossus*.)

Tiquio (Rizal); agas (Albay); бага-as (Occidental Negros); багуи-багуи (Capiz); balangot (Camarines, Capiz).

Scirpus grossus is sometimes used for mats. It must, however, be classed as a rather poor material for this purpose as its stalks are three-cornered, coarse, wide, and thick. It bears flowers from May till November in numerous brown spikelets on a much-branching stalk.

The plant is found in fresh-water swamps and along streams throughout the Philippines.



SCIRPUS MUCRONATUS.

TIKER.

(*Scirpus lacustris*.)

Tiker (Ilocos Norte, Ilocos Sur, Cagayan); great bullrush.

The sedge known as "tiker" in Ilocano is found in swamps and ponds. So far it has been reported to the Bureau of Education only from Ilocos Sur, but it occurs also in Ilocos Norte and Cagayan. It grows to a height of a meter or more and has a round stem, tapering toward the apex. The spikelets are about 1 cm. long, reddish-brown in color, and occur on small flowering stalks that sometimes branch. These stalks all arise from about the same place near the apex of the stem.

The plant is also found in North America, Europe, and Asia.

BILUAN.

(*Scirpus mucronatus*.)

Biluan (Leyte).

Scirpus mucronatus is a three-cornered sedge not as coarse as *S. grossus*. Its many, comparatively large spikelets are crowded together into a single lateral head several centimeters from the top of the stalk. The stalk itself grows to a height of 80 cm. The plant is found in wet places throughout the Philippines, but is not restricted to this Archipelago, occurring also in the warmer parts of the entire world.

PREPARATION.

If the straws of the various species of *Scirpus* are arranged according to their coarseness, starting with the least coarse, they should be placed in the following order: (1) *Scirpus erectus*, (2) biluan, (3) tiker, (4) tiquio. Generally, these sedges need only to be put out in the sun to dry and bleach. Some reports, however, state that they should be only partially dried in the sun and that the process of drying should be completed in the shade or in the house. This may perhaps be necessary so as not to make the material too brittle. The whole stem may be used by folding in one side so that the stalk becomes two instead of three sided. This, however, cannot be done with tiker, which is

round. The sides of the stalks may be separated and the pulp removed and the material thus rendered more fit for weaving into finer grades of mats and hats. The straw can be made more pliable as is done with tikug by passing it between the fingers and a rounded piece of wood or bamboo. The sedges can also probably be worked to better advantage when the air is not so dry, as in the morning and evening and on cloudy and rainy days.

USES.

At present, mats, hats, and slippers made of species of *Scirpus* are rather coarse, but this does not necessarily prove that finer articles could not be manufactured.

CAT-TAIL.

(*Typha angustifolia*.)

Cat-tail (E.); balangot (Batangas, Leyte); caid-qued (Il. and Pang. in Pangasinan); lampacanay (Bohol); tubol-tubol (Oriental Negros). Also reported from Iloilo and Mindoro.

This plant reaches a height of 2 m. It can easily be distinguished from other plants by its semioval stalks and its characteristic spike, cylindric in shape and brown in color when mature.

DISTRIBUTION.

When this marsh plant does occur in low wet places and shallow, stagnant, fresh water, it is found in abundance.

PREPARATION.

Dried in the sun either whole or split into strips.

USES.

The straw is well adapted for the making of slippers. By splitting the straw and twisting it, a better-looking slipper with macramé toe can be made.

The whole stem can be woven into fancy braid and in combination with braided rice straw or buri, colored or natural, can be wound around a framework and made into very pretty flower baskets.

The straw can also be woven into screens. In connection



CAT-TAIL (*Typha angustifolia*).

with this matter, the opinion of a prominent mat dealer in the United States is of interest:

A balangot (*T. angustifolia*) screen would be a commercial article in the United States in length of 8 feet and width of 4, 6, 8, 10, and 12 feet. If provided with a small wooden pulley and a small abaca rope, the screen would sell for about 2 centavos per square foot laid down in Manila.

The straw is also twisted into twine and rope, but does not possess great tensile strength.

In the United States and Europe the chief use of the cat-tail is in cooperage, for filling open seams in the heads and between the staves of barrels. The stalks are also used in foreign countries for chair bottoms and in packing glass bottles and flasks. The soft velvety fibers of the flower spike are used in upholstery.

Chapter VII.—PALMS.

The majority of palms are not only ornamental but highly useful. The straight, erect palm trunks and long leaves, usually gracefully bent, impress the beholder with a sense of dignity and beauty. Some species, however, have no trunk at all or the merest indication of one. Other species clamber in the dense tropical forests that form their natural habitat. These latter—the rattans—because of their economic importance and because they are not ordinarily thought of as palms, will be considered in a separate chapter.

Many palms have long, stout petioles bearing a great number of leaflets which are linear in form. Others, like the palma brava and buri palm, have orbicular leaves on long, massive petioles.

Palms like the coconut, buri, and sugar palms yield not only valuable food products, but are of considerable economic importance because of the industrial fibers obtained from their leaves, midribs, and petioles.

ARECA NUT PALM.

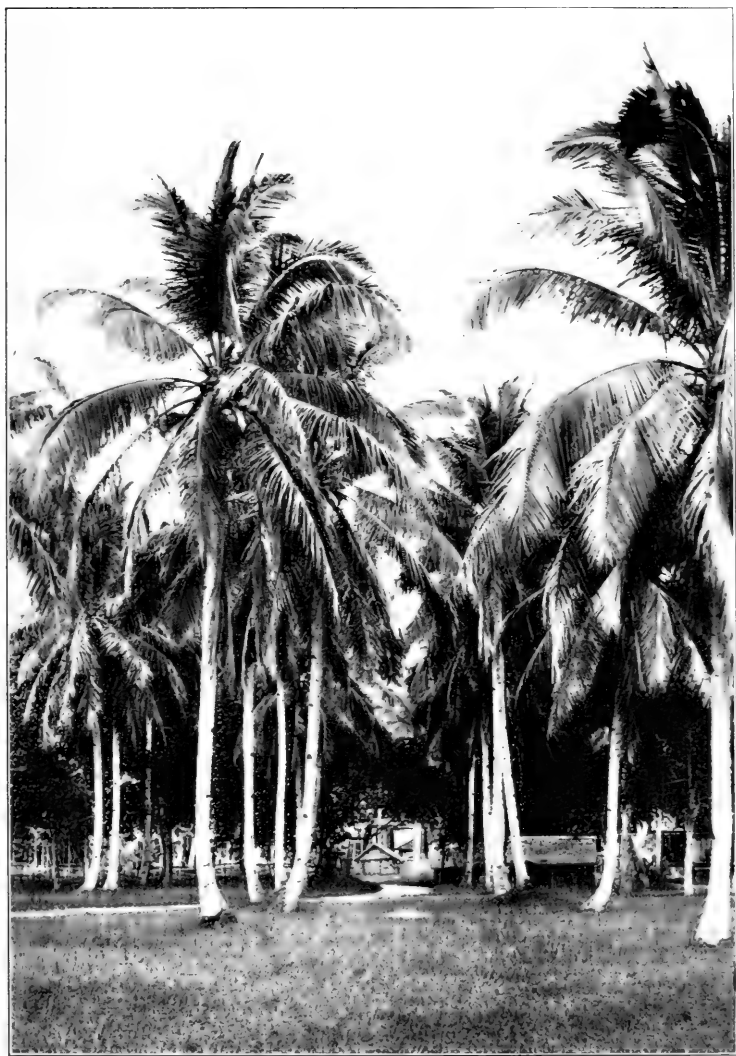
(*Areca catechu*.)

Areca nut palm (E.); bañga (Camarines); boá (Il.); bua (Cagayan); buñga (T.); luyos (Pampanga).

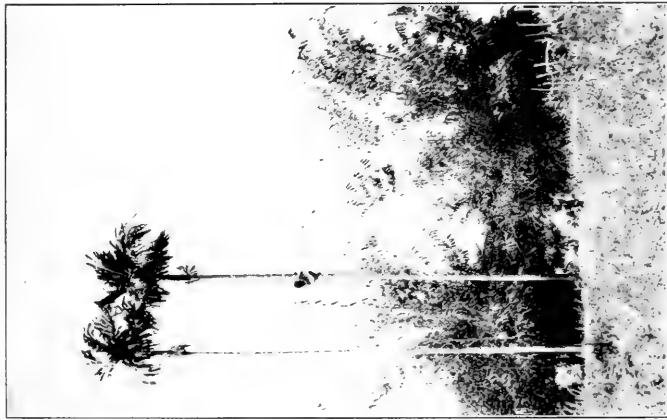
This slender, erect palm produces the areca or betel nuts which are chewed, with or without lime and pepper leaves, throughout eastern Asia and Malaysia.

USES.

Sheaths.—The sheathing basal portion of the leaf petioles and the bracts which protect the flower cluster and fruits are pliable, strong, and tough. The sheaths are dried and used in a number of schools for the inside sole of slippers. They seem well adapted to this purpose. The sheaths (only the inner white surface) are used as wrapping paper for fish, salt, and other products.



COCONUT PALMS.



ARECA NUT PALMS. YOUNG BAMBOO IN THE BACKGROUND.



A YOUNG DUMAYACA PALM (*Arenga mindorensis*).

DUMAYACA PALM.

(*Arenga mindorensis*.)

Dumayaca (Batangas, Tayabas); gumayaka (Laguna); tipon-tipon, bilis (Albay); abigui, romaka (Camarines); belis (Sorsogon); dayumaka (Tayabas). Also reported from Bataan and Mindoro.

The plant is one of the smaller palms and reaches a height of but 6 m. It resembles a young nipa, coconut, or sugar palm, as it is nearly trunkless and has long slender petioles to which numerous leaflets are attached. Unlike the nipa palm, it is not found in swamps.

To help in the identification of this palm, it may be noted that the leaflets are about 20 to 35 cm. long, have a uniform width of from 13 to 18 mm., and a round, serrated tip. The upper surface of the leaflets is bright green and the lower is dull, silvery green in color. The petioles are of grayish-green color with gray predominating, finely speckled, slightly rough to the touch, and free of leaflets for a distance of 1 to 2 m. from the base. Around the base of the petioles are found black fibrous sheaths which are only moderately developed. The fruit is bright red in color, round, and about 1 cm. in diameter and contains three seeds. It occurs in great masses on flower stalks which are from 60 to 90 cm. long.

PREPARATION.

As the lower parts of the petioles are free from leaflets, there is little waste in using them as industrial material. Dumayaca, therefore, furnishes a better industrial material than do those palms whose leaflets extend almost from the base to the top of the petioles and which, because of such arrangement, permit only the use of the sides on which leaflets are not attached. Scraping away the epidermis of the petioles reveals the tissue beneath, which varies in shade from a light to a dark brown. Dumayaca palms were first used as basketry material during the year 1910 in Polangui, Albay.

USES.

Dumayaca is used in making different kinds of baskets such as waste baskets, market baskets, lunch baskets, and the like. The splints are good for both weavers and spokes,

and if a little care is exercised in the preparation of the material and in workmanship, excellent baskets result. Because of its graceful appearance, the palm is well worth cultivating as an ornamental plant if for no other reason.

SUGAR PALM.

(*Arenga saccharifera*.)

Sugar palm (E.); bagot-bat, idiok (Oriental Negros); batbat, ebiok (Bohol); hibiok (Vis., Capiz, Iloilo, Occidental Negros); hidiok (B.) (Albay, Antique, Capiz, Tablas); igok (Antique); irok (Cavite, Mindoro, Tayabas, Zambales); kaong (T.) (Cavite, Laguna); onao (Surigao); palma criste, habiok (Capiz).

In Cavite the palm itself is known as caong, the fiber as cabonegro, and the fruit as iroc. In other parts of the Islands the various parts of the plants have also received special names. The maximum height of the plant is 12 m. The large leaves, made up of a hundred or more leaflets on each side of the petiole (rachis), are remarkably long and attain a length of from 6 to 8.5 m. They finally fall off and leave conspicuous round scars on the trunk. The bases of the petioles are surrounded by coarse, black, matted fibers which remain on the trunk even after the petioles have dropped off.

From the axils of the leaves, stout stalks arise which bear a great number of long pendulous flowering branches up to 1.5 m. long. The palm flowers throughout the year and the fruit is produced in prodigious quantity. Each individual fruit, however, is only 5 cm. in diameter and more or less round (globose).

DISTRIBUTION.

This palm is of general distribution throughout the Philippines, though perhaps more abundant in the provinces south of Manila. It is also found growing from India to Malaysia.

PREPARATION.

Splints.—On account of the position of the leaflets, only the lower part and the front and back part of the petioles can be utilized. The preparation of the material is the



THE SUGAR PALM (*Arenga saccharifera*).

same as for dumayaca. If the material is to be used immediately, the inside part should be removed, but if the splints are not to be used for some time the inner part should be left.

Greenish-white splints may be produced by scraping away the green epidermis of the young petioles. Such splints are also obtained by scraping below the dark-brown portion of an old petiole. A dark-brown color verging almost to a black may be obtained from old petioles. Light-brown splints are procured from the upper part of old petioles or the lower part of young ones. Splints, with the epidermis left on, can be used to give variation to a design.

Fibers.—The coarse, fibrous sheaths are cut off near their base of attachment. The black, hard fibers that occur in them are removed and may be used as a substitute for bristles; the softer fibers are pulled out and twisted into strands for rope. These fibers are called cabonegro.

USES.

Splints.—The splints make excellent weavers and are also fairly satisfactory for spokes of baskets, but are not as tough as those obtained from tipon-tipon.

Rope.—Rope made from the fiber sheaths of the sugar palm withstands well the action of salt water. The strongest fibers have great tensile strength, but it is extremely difficult to get evenly matched fibers of uniform diameter. The fibers can also be used for thatching, and some reports state that in the course of time they become fireproof. The fibers are also employed in caulking boats.

Brushes.—The public schools in several places are utilizing the fibers in the making of floor, horse, and hair brushes. The fibers are an excellent substitute for bristles, but are rather too stiff and coarse for certain types of brushes. It is believed, however, that an immersion of the fibers into lumbang or linseed oil would soften them and make them more pliable.

Midribs.—If the midribs are separated from the leaflets and cleaned, they can be woven into certain types of trays and baskets.

PUGAHAN.

(*Caryota cumingii*.)

Pugahan (Sorsogon, Tayabas); hagol (Albay, Sorsogon).

There are a number of species of palms in the Philippines that may be called fishtail palms¹ on account of their peculiarly shaped leaflets which look like a fish's tail or fin. The species known as *Caryota cumingii* has a trunk that is generally slender and leaves that are scattered along its upper part. The complete leaf measures 1.5 m. and the leaflets about 20 cm. The inflorescence is pendulous, about 80 cm. long, and made up of numerous flowering branches (spikes). The male flowers are dull purplish and yellow in appearance; the fruit is round and purple in color.

DISTRIBUTION.

The fishtail palms are very abundant in some forests. They are not, however, as evident to the casual observer as are other palms for they usually do not occur in the open country. The tree is widely distributed throughout the Philippines.

USES.

Splints from the petiole of this palm are used in basketry.

COCONUT PALM.

(*Cocos nucifera*.)

Coconut (E.); cocos (Sp.); lubi (Cebu); niog (T., Il.).

This tree, often called "the prince of palms" is too well known, especially in the Tropics, to require a botanical description.

PREPARATION.

Coconut shell.²—The matured brown coconut shell is the best for polishing. The white shell may also be used, but it does not take so high a polish as the brown shell.

¹ See Plate XXV.

² From a report prepared by Messrs. E. Carretero, J. Quisteria, and M. Bautista, teachers in the Manila city schools, and submitted to the General Office through the city superintendent.



FRUIT OF THE SUGAR PALM.

Remove the fibrous husk of the nut. Then cut off the upper part (the part containing the "eyes") with a saw, so that the meat and the water may be easily removed. Use a file to make the shell thin and smooth on the outside. After filing, any coarse kind of sandpaper may be used; but as the shell becomes thinner, a finer grade of sandpaper should be employed, so as to take off the scratches made by the coarser paper.

The shell is now ready for polishing and converting into the finished product. The smooth shell should be made wet with alcohol and rubbed with powdered pumice stone many times until it looks shiny and all the sandpaper scratches disappear. Put 100 grams of shellac into $1\frac{1}{2}$ liters of denatured alcohol. Shake the bottle well in order to thoroughly dissolve the shellac. With several drops of this mixture moisten the inner surface of a soft cloth in which are wrapped in the shape of a ball several other pieces of soft cloth (be sure the cloth is clean when made into a ball). Do not use too much of the alcohol-shellac mixture. With this cloth ball, moistened as above stated, rub the surface of the shell firmly, using plenty of "elbow grease." If this does not produce a good polish, unfold the outer cloth of the ball and put inside three or four more drops of the alcohol-shellac mixture. Rub the shell again until it looks shiny. The shell must not be touched with the bare hands. Handle it with a piece of thin cloth. When the shell has been properly polished with the alcohol-shellac mixture, put a little olive oil (a drop or two, perhaps) into the same cloth ball and rub the surface of the shell thoroughly.

Coir.—To produce coir, the outer surface of a piece of the coconut husk is pounded and the glossy skin pulled off. The dark, fibrous layer immediately under the epidermis is removed, and twisted into strands for rope. The fibers in the remaining light-brown layer are pulled apart, cleaned by hand, and can then be used for mats.

Roots.¹—The roots of coconut palms are excellent material for basketry. The roots are very pliable and free from

¹ Division Memorandum, No. 9, s. 1912, Occidental Negros.

knots and are easily prepared. Young roots are white in color, while the older ones are pink. The preparation is very simple, it being only necessary to clean them by means of a "batakan" (a piece of tin with holes punched in) and to dry them in the sun for a few hours.

USES.

Coir.—The fiber of the husk of the coconut known as coir is a valuable product. It is used in the manufacture of ropes and cordage and is woven into bagging and matting. It can also be used for the making of strong doormats. The fiber is also employed in furniture shops and carriage factories for stuffing cushions.

"Mutt heads" are carved out of coconut husks.

Shells.—Polished coconut shells can be made up into a number of articles such as spoons, cups, finger bowls, nut dishes, savings banks, powder boxes, hair receivers, catchalls, collar and button boxes, and other objects. The shells would also serve well for the bottom of pin cushions. A pretty souvenir article such as a small guitar with a coconut body would probably sell as a curio.

Coconut midribs.—At the first Philippine exposition in 1912 one or two provinces exhibited tables and chairs made of the midrib of the leaflets of the coconut which were strong and serviceable. As the midribs are pliable, they furnish a good material for the making of certain types of trays and baskets. They are commonly used for making coarse brooms.

Splints.—The outer covering of the coconut petiole can be used for spokes in basketry. The inner surface of the splint is white; the outer, if secured while the leaf is still growing, is green. If the splints are obtained from the petiole of a dead leaf, their outer surface is nut-brown in color; all these colors may be used with white to give variety to a design, but the splints have fewer shades than those from dumayaca.

Leaflets.—The leaflets are used for hats, mats, baskets, thatch, and various other purposes. The articles made from the leaflets are not, however, very durable.



YOUNG BURI PALM (*Corypha elata*).

In the young state, the buri palm is of the greatest economic importance.

BURI PALM.*(Corypha elata.)*

Buri (Sp., F.) (Albay, Antique, Batangas, Capiz, Cebu, Iloilo, Ilocos Norte, Leyte, Nueva Ecija, Occidental Negros, Rizal, Sorsogon, Tayabas, Zamboanga); buli (Vis.) (Bohol, Cebu, Oriental Negros), (T) (Laguna); ebus (Pampanga, Tarlac); piet (Pangasinan, Nueva Ecija); silad (Albay); silag (Il.) (Ilocos Norte (Il.), in Pangasinan, Tarlac, Union); taktak, bagatay (Nueva Vizcaya); talipot palm (E. in India).

The buri is one of the largest palms. The trunk attains a height of 20 m. and a diameter of 0.7 m.; the leaves are up to 3 m. in length; the petioles supporting the leaves are 3 m. long and 20 cm. thick. When the plant reaches maturity, variously estimated from twenty-five to forty years, it gradually drops all its leaves and develops at the top of its trunk a much branching inflorescence often 7 m. high.

The trunk is very erect and spirally ridged. Its wood, however, is too soft to be of any commercial value.

The full-grown leaf is circular in outline, with its lower one-third to one-half entire, like the palm of the hand, and the upper part cleft into 80 to 100 segments, each from 1.5 to 6 cm. wide and appearing like fingers spread apart.

The petioles supporting the leaves are provided with long, stout, curved spines. Both the margin of the petiole and the spines are black in color.

The individual flowers of the buri palm are greenish-white in color and only from 5 to 6 mm. in diameter. In spite of their minuteness, they are, nevertheless, perfect flowers with six stamens and with calyx, corolla, and ovary showing plainly a division into three parts. Thousands of these flowers occur on the large, terminal, much-branched, pyramidal inflorescence. The lower branches of this inflorescence may be as much as 3.5 m. long, the upper gradually shorter, the highest about 1 m. long.

From ten to twelve months after flowering, the fruits are mature. They are from 2 to 2.5 cm. in diameter and each contains an extremely hard seed 1.5 cm. in diameter. After fruiting, the palm dies.

The buri palm is found in most parts of the Philippines, but grows in greatest abundance in the central part of the Pampanga Valley and in southern Tayabas.

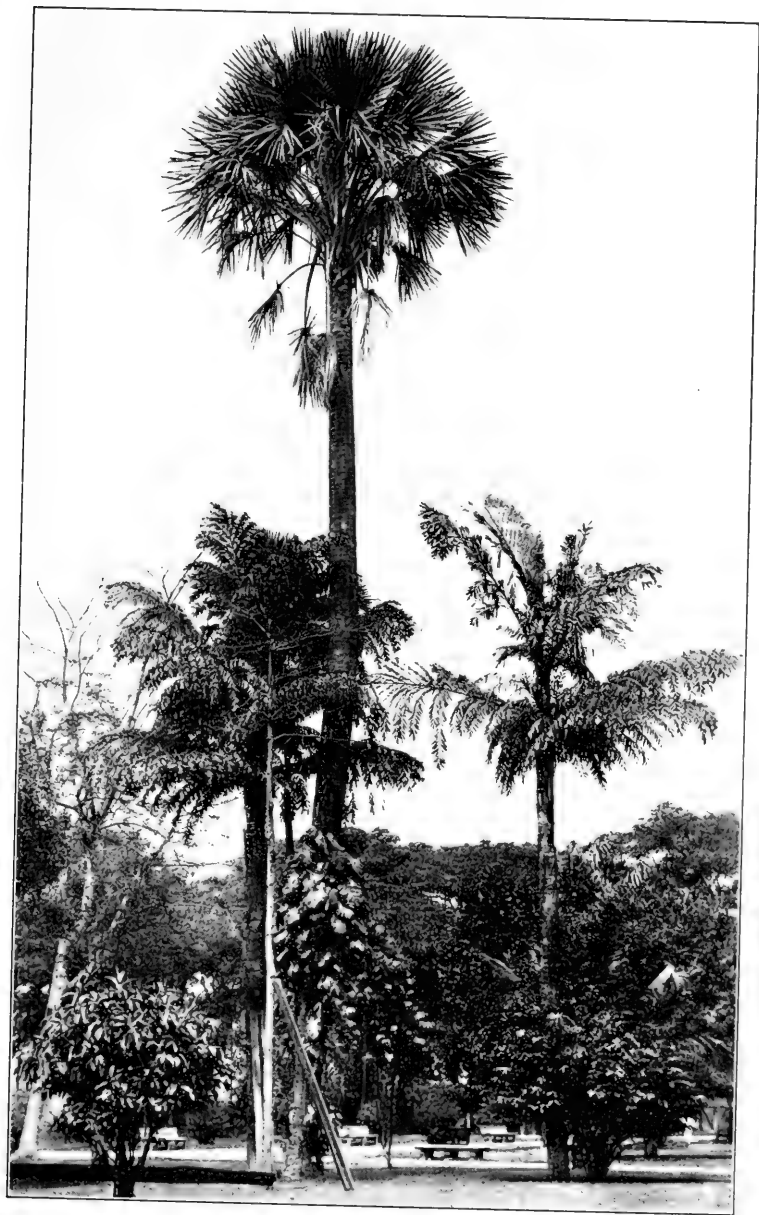
PREPARATION.¹

Buri strips.—Buri strips are prepared from the young, unopened leaf of the buri palm. The coarsest strips are made by separating the segments from the midribs and drying them in the sun. A higher grade of material results from boiling them in water. Such strips are suitable only for bayon (bag) manufacture and to be woven into coarse mats for baling purposes.

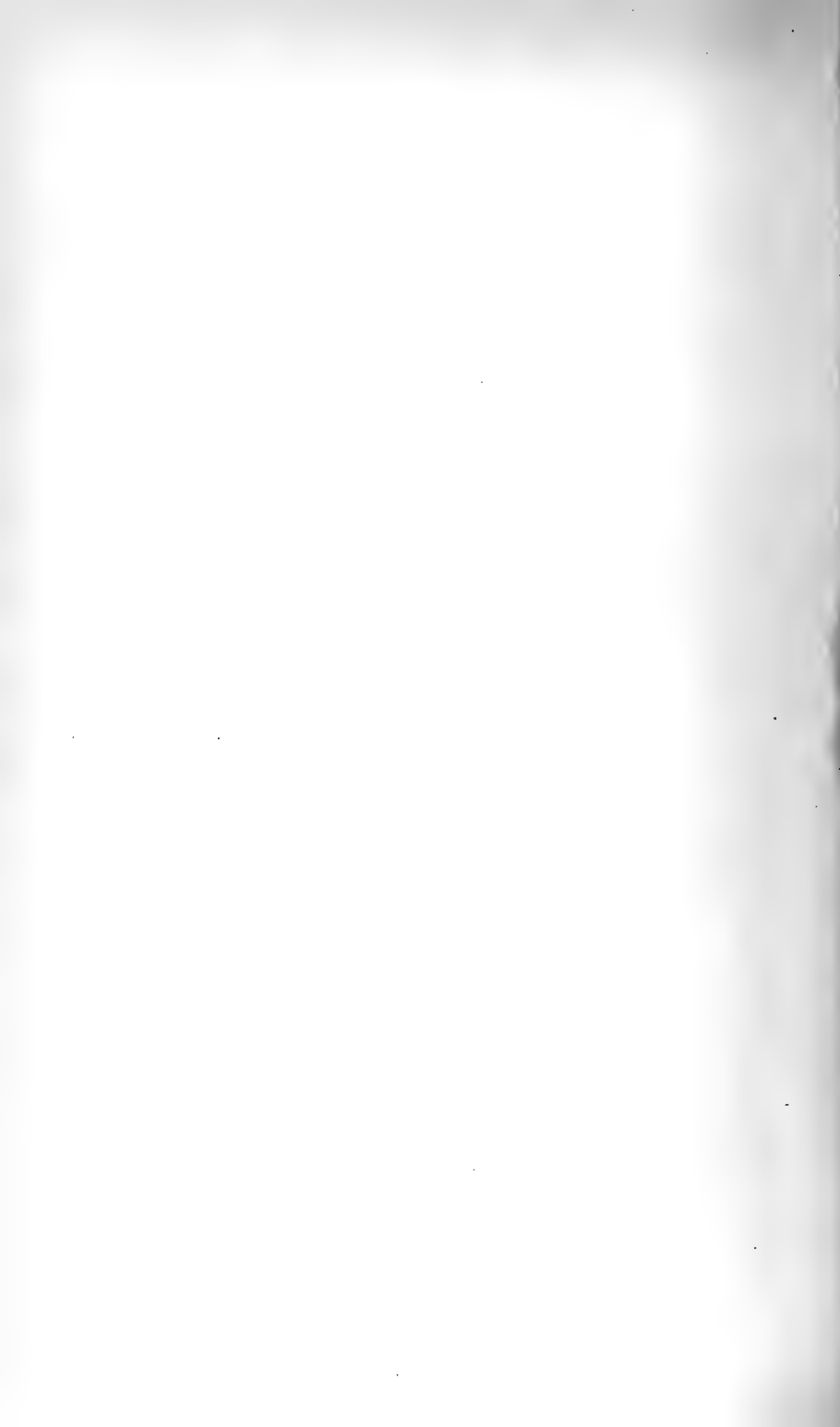
Several methods of bleaching buri strips exist in various localities. An exact description of the processes is somewhat difficult, since the persons who produce the strips have no definite idea of the proportions and quantities of the various materials which they use, and often do not care to divulge what they consider trade secrets. In several cases, nevertheless, supervising teachers have succeeded in obtaining fairly exact data on the preparation of buri strips.

However, the same method carried on in different towns seems to result in different qualities of strips. These differences probably result from slight variations in the method of preparation. It has also been found that the age of the leaf, as determined by the length of the petiole, influences the color of the strips produced. In some districts the unopened leaf is not taken if the petiole is over 2 inches in length. In other places, leaves with petioles about 1 foot long are considered ready to be cut. It is probable, too, that the composition of the water in which the strips are boiled influences its color. Mauban, in Tayabas Province, has the reputation of producing the whitest buri strips. Mr. John H. Finnigan, supervising teacher, attempted to introduce buri strips into the schools of Gumaca, Tayabas, where the buri palm is very plentiful. The work was in charge of expert weavers from Mauban, but only a poor quality of strips was produced. It was claimed that the water in which the segments were boiled, according to the

¹ THE PHILIPPINE CRAFTSMAN, Vol. I, No. 3, September, 1912.



THE TALL PALM IN THE CENTER IS A BURI PALM. TO THE RIGHT AND LEFT OF IT ARE FISH-TAIL PALMS.



process which is explained later, did not whiten them. It is a fact that in Mauban the water of the town fountain is used to produce the fine white strips. During several years of experiment, Mr. Finnigan found no place outside of Mauban which produces strips equal in color to the Mauban strips, but he has noted that the second best strips come from San Fernando, Gumaca, where there is an especially clear stream of water.

In fact, all reports would seem to indicate that clear, pure water is essential to the production of the finest white buri strips, and only such should be used in all the processes of the various methods outlined here.

The Arayat process.—Mr. Robert Clauson, supervising teacher, has determined the process of whitening buri strips in Arayat, Pampanga, to be as follows: The segments are separated from the midrib and rolled together loosely in bundles the size of a plate so that the water may pass between the segments. These rolls are placed in a large jar¹ or vat of water containing tamarind leaves² and alum, and the whole is boiled until about one-half of the water has evaporated. During the boiling, the buri must be well covered with tamarind leaves and must not be allowed to project above the water. The rolls are then placed in a jar full of clear water and left to soak for three days. The strips are subsequently washed several times in the river during a period of three days, and after each washing are laid on the grass or along fences to dry. The oftener they are alternately washed and dried the whiter and tougher the material will be. After the final drying, which should be thorough, the strips are rolled very tightly into bundles.

The San Luis method.—The method of whitening buri strips followed in San Luis, Pampanga, is described by Mr. James H. Bass, supervising teacher. The unopened leaves are brought down the Chico River in rafts. The segments are removed from the midrib and boiled for four hours in 5 gallons of water to which 1 liter of nipa vinegar, a lump of alum the size of an egg, a handful of tamarind leaves,

¹ Tin cans should *not* be used for boiling acid solutions. Use earthen jars.

² *Tamarindus indica*.

and a handful of pandakaki ¹ leaves have been added. Other steps follow as in the previous process.

The Mauban process.—The following description is taken from Circular No. 27, series 1911, of the division of Tayabas:

Let the unopened leaves, cut from the stalk, stand in a cool shady place for several days. Open the leaves and separate the segments from the midrib with a sharp knife. Put these carefully into a jar or other suitable receptacle filled with a boiling solution of two-thirds water and one-third white nipa or coconut vinegar. Keep the solution boiling until the segments are cooked so soft that folding them leaves no crease.

Spread the cooked leaves on clean grass to dry in the sun. The drying process may require one or two days. When the segments are quite dry, prepare a jar with clear, soft water and put them in this to soak over night. In the morning remove them from the jar, wash them thoroughly in clear running soft water, and place them in the sun. At noon repeat the washing process until the segments open, then dry thoroughly in the sun.

It is customary to roll the buri into coils in order to make it more convenient to store. The dry leaflets may be made flexible for this purpose by laying them on the grass at night. After a few minutes they will be flexible enough to roll. Care must be taken to roll the segments smoothly. When used, they should be smoothed carefully and then split into the width required.

The process can also be followed with rice vinegar substituted for the tubá vinegar.

Rice vinegar is made as follows: Wash three-fourths liter of rice and cook it in water until it becomes very soft and starchy. Put this in a clean jar and add cold water until the jar is two-thirds full, then cover the jar and let it stand five or six days. This mixture will become very sour. Strain it through a piece of sinamay or other cloth. Cook the segments in this mixture instead of in the solution described in the first process, and then carry out all the other steps.

The Romblon process.—In Romblon great care is exercised as to the age of the unopened leaf taken for the production of strips. If it is intended to produce bleached material, leaves having petioles about 2 inches long are selected. In the following description, which was submitted by Mr. R. L. Barron, head teacher, one unopened leaf is taken as a unit. The midribs are removed and the segments are rolled into round bundles, say, by fives. These are boiled in clear water for about three hours. The leaves

¹ *Tabernaemontona pandacaqui*.

are then placed in a mixture of half a liter of tubá vinegar (or 3 liters of vinegar made from cooked rice or one-fourth liter of lemon juice) to which enough water has been added to cover the rolls of buri, and boiled for about five hours. The material is then spread in the sun for three days to dry, care being taken that it is not exposed to rain or dew. The segments are then placed in cool, clear water for twelve hours and again placed out in the sun to dry for two days.

Buri raffia.—The full-grown, opened buri leaf is large and circular in outline, but as a shoot—before its surface is exposed to the sun—the leaf blade is folded together like a fan. Each fold is made up of two sides and may be called a leaf segment. Along the thin edges the segments are partly united. They are closely packed together and are nearly of the same width, the largest in the center being about 2 m. long, the others on both sides gradually shorter. The leaf blade is borne on a long petiole grooved on its upper surface.

Buri raffia is the skin stripped from the leaf segments of the buri shoot before the blade has unfolded.

Each segment is like a long narrow leaf, folded at its midrib. The skin for the raffia is pulled off from the outer surface of the two halves. Occasionally it is derived from the inner surface. Raffia cannot be obtained from the opened buri leaf, as the skin adheres too tenaciously to the underlying tissue to be removed to advantage.

The epidermis should be removed, preferably immediately after the shoots have been cut from the trunk, or at least within twenty-four hours. If this is not done, it is not only difficult to obtain the raffia, but in stripping the material is easily torn into shreds and is then less valuable for industrial purposes.

To obtain the raffia, a leaf segment is selected and its midrib is cut away. This gives two strips from each segment. The best raffia is obtained from the upper surface of each strip.

The base of the leaf segment is ordinarily held in position by the right foot. The upper surface of the segment is held upward and in such a way that the segment is parallel to the body. About 2 inches of the tip of the segment is

grasped with the left hand (palm upward) and folded forward with thumb and forefinger, so that the two upper surfaces are brought in contact. The folded segment is then usually placed on the knee with the thumb bearing strongly on the folded part. Keeping the left hand in this position, the leaf is then grasped by the right hand and pulled so that a sort of blister is formed at the crease. (To do this deftly requires practice.) Holding the leaf taut, the skin is then picked up at the blister and pulled away from the underlying tissue.

During the operation it is essential that the segment be kept taut, or the skin will be torn into several strips. If a very white material is desired, the raffia obtained must be freed from the pulp, which still adheres to it, by being scraped with a knife. It is immediately placed in the sun for three hours.

In practice, the skin from the inner surface of the segment is seldom used for raffia. It can be prepared by scraping away the pulp with a sharp knife, a process which requires considerably more time than that needed in preparing the outside skin. The inner skin is stronger than the outer, but it is not so light in color and must not be combined with it if a uniform color effect is desired.

Buri raffia is easily manipulated by little hands and is consequently an excellent material for use by young children. Another notable quality is the ease with which it is dyed and the beautiful tones which it takes. The raffia should be dampened before being used.

Buntal.¹—Buntal is obtained from the petiole of the opened leaf of young buri palms.

The process of extraction is as follows: The petiole of the opened buri leaf is cut off from the trunk at its base and generally divided into pieces about 3 to 4 feet long. The spines which occur on the sides are removed. A few inches of the epidermis on both sides near the base of the petiole are taken off and the exposed part thoroughly beaten with a wooden club or blade of a bolo until the ends of the fibers

¹ Discussion on the preparation of buntal and Calasia fibers is based mainly on Bulletin No. 33, Bureau of Education.



BURI PALM IN FLOWER, WITH THE LEAVES BENT OVER AND DEAD.

separate from the surrounding pulp. A strip of epidermis is then partly torn off from the upper surface. With it the petiole is tied in a slanting position to a cross piece of some kind and in such a way that the beaten end is nearest the stripper. A few fibers are then grasped in the hand and drawn out with a steady pull, the operation requiring skill and practice.

If the whole petiole is pounded, it is much easier to pull out the fibers, but they are likely to be discolored on drying.

The extraction of the fiber is best done in the shade or early in the morning or late afternoons, while the petiole is still fresh. The buntal fibers obtained vary in grade. This, as a rule, depends on the age of the fibers—the youngest being the finest; and the oldest, the coarsest.

There are various methods applied by Filipinos in getting the extracted buntal fibers ready for weaving. They may be immersed for two or three days in jars filled with water in which rice has been cooked and then placed for three or four days in vinegar to toughen the fiber. Subsequently they are washed in clear water and are then ready to be used.

Sometimes the first part of the process just described is omitted and the buntal fibers are put for about one or two weeks in jars containing half vinegar and half water, after which the fibers are taken out and plunged into boiling water and allowed to stay in it for a few minutes until the water boils again. They are then taken out and dried.

There is still another process followed. The fiber is first soaked in water and then boiled in water containing vinegar.

If it is desired to flatten the fibers one of two processes may be followed. The first is more laborious and takes a longer time and is generally tried on the finer grade of buntal. The second is easier and quicker and applied to coarser fiber. The first consists in working the fiber between a sharp-edged instrument of some kind and the thumb; the second, in rolling the fiber under a heavy, cylindrical log working in a groove.

Like all fibers, buntal should be worked in a cool, moist atmosphere, otherwise it becomes too brittle. The best time is in the cool of the morning or evening on bright days or at any time on cloudy and rainy days.

Buri petiole.—The outer surface of the buri petiole yields rather unsatisfactory splints.

Calasiao strips.—Calasiao strips are obtained from the midribs of the unopened buri leaf shoots. In maturity these midribs are spread out radially and serve to hold up the leaf surface to the sunlight. The midribs used for strips must be carefully selected or they will not all be uniform in color—some will be darker than others—due to the fact that, since they are crowded together in the shoot, some midribs are exposed to the light while others are not. Only the unexposed midribs should be used if a good white fiber is desired.

As previously explained under buri raffia, the blade in the shoot is folded. Each fold is a segment. The segments in the unopened and opened blade are partly united.

These segments are separated but not cut from the petiole, and the folds are spread out for drying during several mornings and afternoons or for a day or two in some shady place. Quick drying in the direct rays of the sun makes the midribs very brittle. When there is but little moisture left in the midribs they are ready to be worked.

The work is done at night or in some cool, moist, shady place. The leafy parts of the segments are removed from the midrib with a knife or sharp instrument of some kind. The midribs are then split lengthwise into two or sometimes more parts and allowed to dry for another day. They are then made finer by drawing them between a knife and any solid object having a small groove. The result is the Calasiao strip.

Coarse buri midrib splints.—The midribs of the unopened buri leaf after drying and trimming form good spokes and excellent weavers.

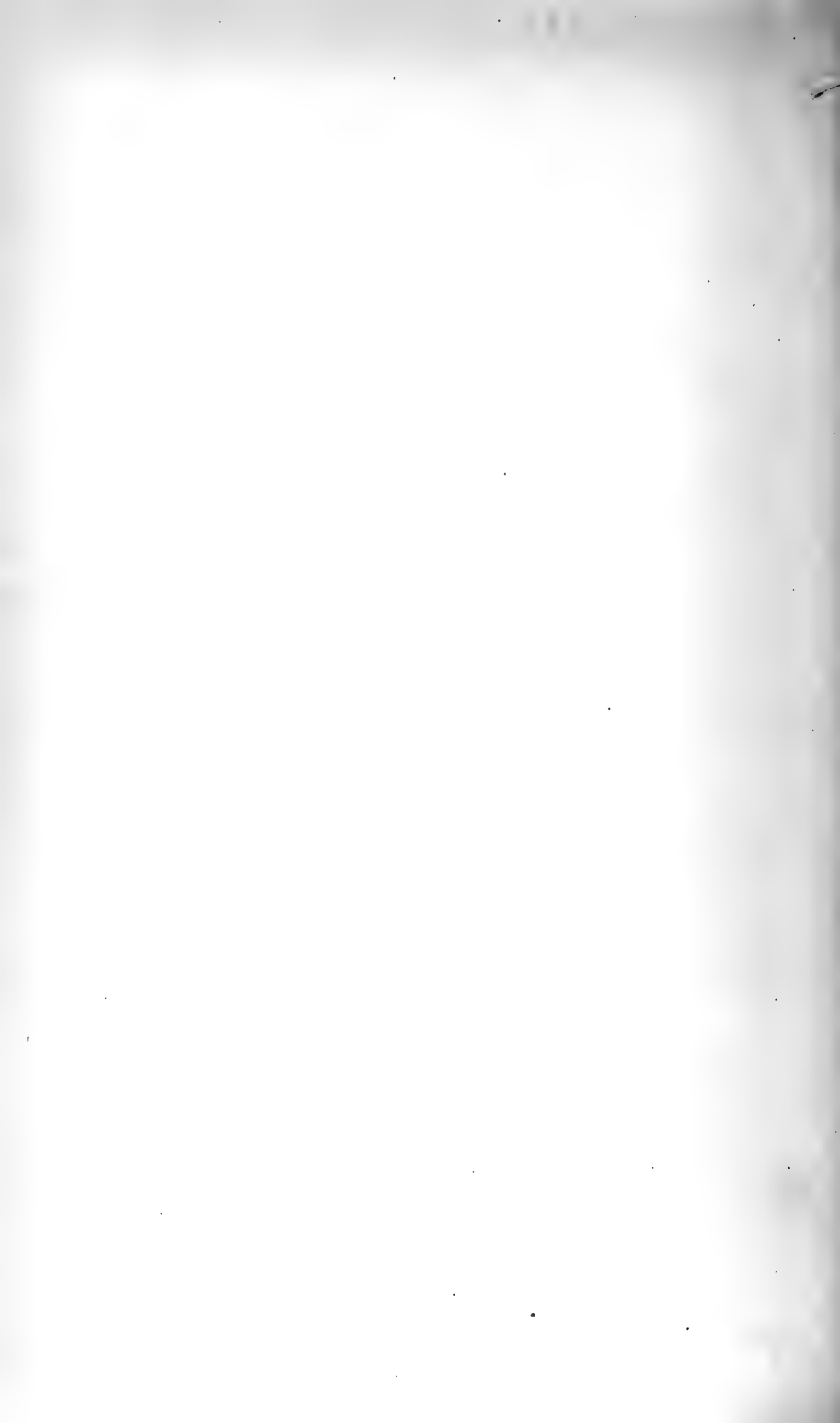
USES.

Buri strips.—Buri is the easiest of all materials to weave and can therefore be used to advantage in simple exercises by primary pupils.

Hats.—Buri hats, either in a single or double weave, are exported from the Philippines in large quantities and the trade in them seems to be steadily increasing. The public



BUNTAL FIBERS EXTRACTED FROM THE PETIOLE OF AN OPENED BURI LEAF.



schools of Arayat, Pampanga, have attempted to improve the hat by using four-ply buri. Each ply is narrower than the one below it and the effect is rather pleasing.

Mats.—In all buri districts, mats are made from bleached buri strips and are sold by the thousands in local and inter-provincial trade. The colors are often too bright and not well combined. The best buri mats are made on the island of Romblon and are distinguished from other mats by their "open-work" borders. Romblon schools have sent in to the industrial museum of the Bureau of Education a number of buri doilies of various shapes and designs which are rather attractive. Buri mats are inferior to sabutan mats in wearing qualities.

Bayones.—Unbleached buri strips are used in making "bayones," or sacks, employed as containers for sugar and other products. Necessarily, they must be produced cheaply and their making is not advisable except in the lower grades of the public schools—and then more in the nature of a class exercise. They are not very strong, but as bags of this kind are usually intended for temporary use, cheapness in price rather than strength, is the first consideration.

Desk baskets.—The public schools in several provinces are making desk baskets in which fine buri strips are knotted around a lattice work of thin sticks of bamboo, rattan, or other woody fiber. These baskets are decorated around the rim with nito and will readily take the place of wire letter trays used in offices. Such buri baskets are superior to those made of wire in that they will neither scratch the table nor rust.

Hand bags.—A number of schools are making hand bags in the over and under weave, hexagonal weave, or by knotting fine buri strips around a foundation. One of these bags from Bohol in the industrial museum of the Bureau of Education, illustrating the over and under weave, has elicited much favorable comment and demonstrated that a good type of hand bag can be made of buri strips.

Button and collar boxes.—The Mangyans of Mindoro make very pretty baskets, hexagonal in weave, that can be used for collars or small articles, in which buri, black

nito, and rattan dyed red are utilized. The buri serves as a foundation upon which the materials just mentioned are superimposed. The baskets hold their shape by having a few strips of bamboo inserted in the top of the cover and at the bottom. Romblon baskets of this type are more elaborate; decorations of various designs and colors being embroidered into the hexagonal weave.

Tobacco cases.—Cigarette cases of buri and nito find a very ready sale. They are woven in the ordinary mat weave, but have narrow black nito strips superimposed on wider buri strips.

Fans.—Fans are sometimes made of buri, but as yet the product is rather crude and a better article must be made if a steady sale for them is to be established.

Buri raffia.—The material sold in foreign markets as raffia is generally obtained from the *Raphia ruffia* palm of Madagascar. The raffia used in the Philippines is from the buri palm and compares favorably with that from the raphia palm.

Buri raffia takes colors readily and fine results can be obtained. It is a material well adapted for the making of coiled baskets. Care, however, should be taken to see that the colors used are pleasing and harmonious. Quite as important is also the shape of the baskets. They should be symmetrical and graceful in outline.

In Bohol and other parts of the Visayas, buri raffia is woven into cloth and mats. These mats are rather expensive as yet and not very durable.

Buri raffia, however, is excellent for the making of carriage cushions or for cushions to be thrown into easy chairs or cozy corners. The carriage cushions ought not to be embellished with velvet edges in imitation of Japanese and foreign styles, for prettier cushions can be made by using the same material or at least native Philippine material instead of velvet. The cushions for the home can be made fancy and artistic by embroidering them with colored abacá braid or cord. Window hangings of buri raffia cloth with stenciled bamboo or Philippine designs, and picture frames made of this material with a design stenciled or embroidered on in colors, are suitable for dens or for homes where some-

thing ornamental and not too expensive is desired. The cloth is excellent for screens.

In a number of schools experiments have been made to determine the suitability of buri raffia for various articles. Slippers with abaca soles and buri raffia uppers have been tried. The raffia in a macramé weave has been utilized for bags and cushions. Attempts have been made to crochet buri raffia for doilies.

It might also be well to try out buri raffia for table covers, screens, piano scarfs, and other articles intended for summer use in country houses in the United States.

In the Philippines, the raffia is also occasionally woven into hats.

Calasiao hats.—The principal use of Calasiao strips is for hats. These are woven chiefly in Calasiao, Pangasinan, and are known in Manila by the name of the town of their principal manufacture. In the Visayas, they are more generally called Pototan hats, as Pototan, Iloilo, makes them in large quantities. The hats are always made in the close weave and can generally be distinguished from other Philippine hats by the liberal quantity of rice powder with which they are covered. Calasiao strips bleach fairly easily and hold their color well. The hats have a rather dull appearance, and in this they differ from the “close weave” buntal and rattan hats with their silky or glossy surface. In the medium and poor grades of Calasiao hats a few light-brown strands occur in the weave which are due to the fact that less care has been exercised in selecting the midribs which are not all of the same shade. The Calasiao hats are more expensive than those made of bamboo and at the same time are better not only in appearance, but also in wearing qualities, as the strips are more pliable and do not break as easily as bamboo strips do. Occasionally Calasiao strips are woven into hats in combination with nito strips.

Tobacco cases.—In Pangasinan and some towns in the Visayas, very fine Calasiao strips either alone or interwoven with nito strips are made into very pretty tobacco cases—small ones for cigarettes and large ones for cigars. The majority of these cases are very dainty and well made, and if not priced too high find a ready sale in local markets.

Basketry.—Within recent years a number of public schools have begun to utilize successfully the midribs of the unopened buri palm shoot for baskets and trays of various types. For such articles the midribs need less careful preparation than that required for Calasiao hats.

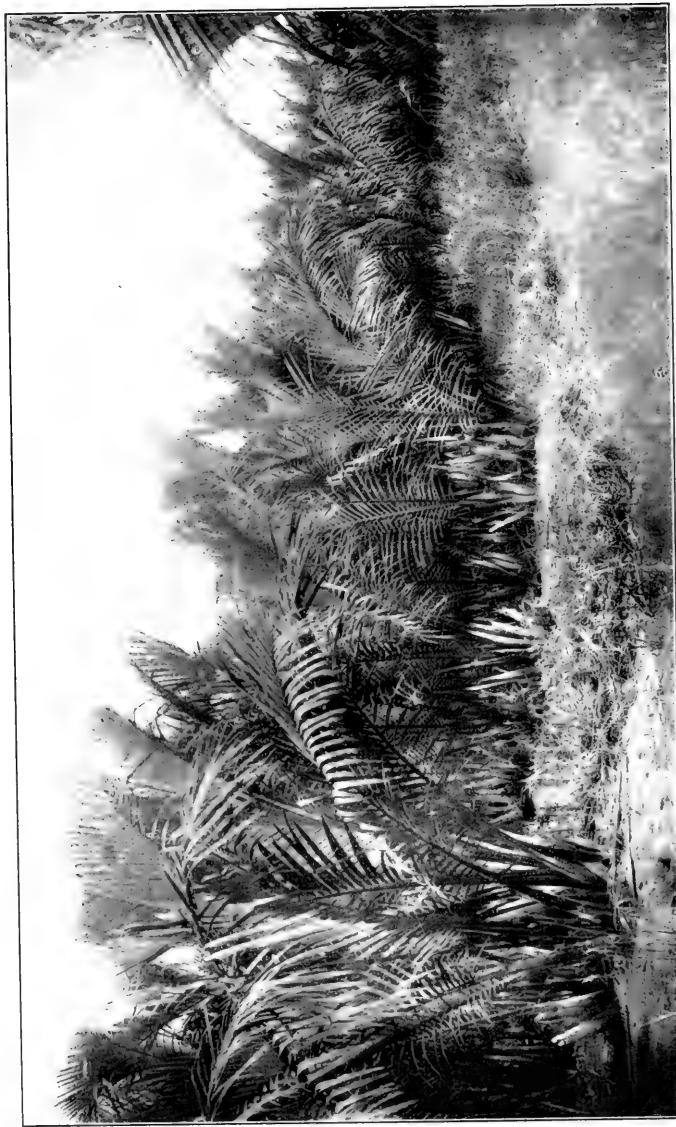
Brooms.—Rough brooms are also made from buri midribs.

Buntal hats.—The buntal fiber is used in the making of hats, also known locally as Lucban hats, from the town of origin in Tayabas Province. In export trade they are known as “Bangkok” hats, although none are shipped from that port. These hats are made in the “open,” or simple over and under weave, which results in a very light hat now popular in the United States. Fancy weaves are introduced into these hats for decorative purposes. One such weave gives an effect resembling the Leghorn straws of Italy.

The buntal fiber is obtained in large quantities in a number of towns in Tayabas and in a few places in Laguna. The principal center of trade and manufacture for these hats is Lucban, Tayabas, but there is also a scattered production of this kind of hat in a few other provinces, among the more important of which are Laguna, Negros, Camarines, and Ilocos.

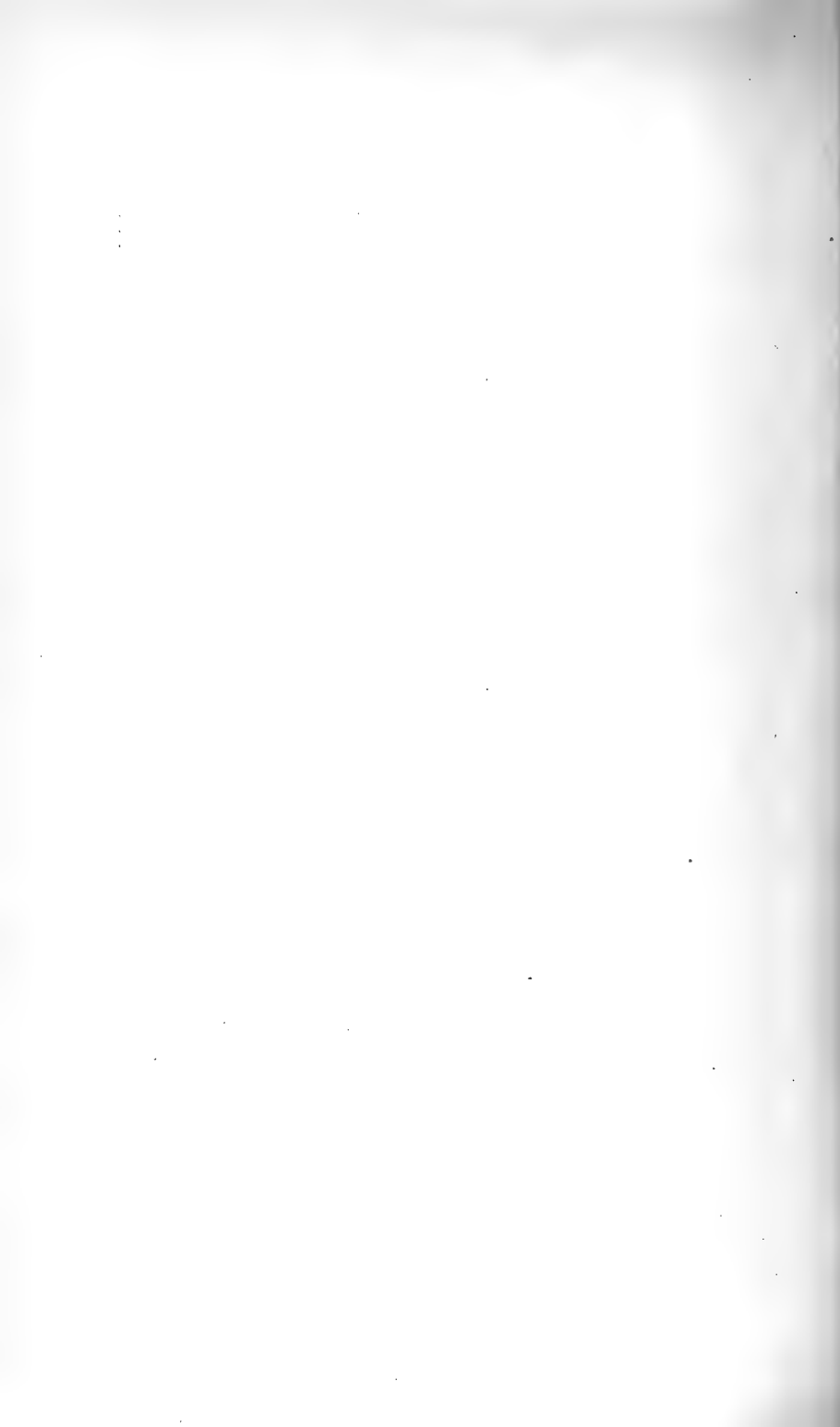
Buntal fibers were introduced into the town of Baliuag, Bulacan, a few years ago. The introduction was rather fortunate, for the weaving of the buntal in the “close” weave—the same as bamboo—has, in the opinion of many people, improved its appearance greatly. At present, about half the hat weavers in Baliuag and neighboring barrios have turned to the making of buntal instead of bamboo hats. The buntal fibers are much finer than the usual grade of bamboo splints. Moreover, the close, sawali or twilled weave employed takes much more time than does the open weave of Lucban. Only the best weavers can make the buntal-sawalis or bali-buntals as these Baliuag hats are called. Hence they are much more expensive than the Lucban product, grade for grade. These hats have sold well in the United States and are usually known there as “Manilas.”

For hats in the “open” weave the buntal fibers are flattened; for those in the “close” weave, they are usually left in their natural round state.



Reprint Phil. Journ. Sci., Vol. VI, No. 2.

A CULTIVATED NIPA SWAMP.



Lucban hats are light, pliable, durable, and very neat in appearance. The finest grade of the Baliuag buntal hat has a beautiful sheen, is exquisite in workmanship, and the peer of any straw hat made. It is too light to afford sufficient protection from the rays of a tropical sun at mid-day, but is excellent for evening or for summer wear in temperate regions.

Buntal baskets, hats, and tobacco cases.—Buntal fibers are used as a weaver for both body and rims of small baskets and for rims only of large baskets. They also serve well for pretty cigar and cigarette cases.

Rope and brooms.—The whole petiole is sometimes pounded and the fibers are extracted and made into rope. The rope is strong, but the use of the material for such purpose ought not to be encouraged as finer and more remunerative articles can be made from buntal. The fibers are also utilized at times for making floor or whisk brooms. These floor brooms are for sale in a number of Chinese stores in Manila. It would not seem advisable, however, to encourage in schools the making of a cheap article from a fine fiber.

Buri splints.—Splints obtained from the petiole of the buri palm are not as satisfactory in basketry as those from other palms, but they can be utilized.

SAGUISE PALM.

(*Heterospathe elata.*)

Sagise, seguisse (Bohol); taguisi (Albay). Collected also by B. of S. in Cagayan, Camarines, Cebu, Laguna, Mindoro, Zamboanga.

This species of palm is widely distributed throughout the Islands, but has so far been reported to the Bureau of Education only from Bohol and Albay. The compound leaves are about 4 m. long; the petioles 1.5 m. in length. The palm resembles dumayaca, but the petiole is more deeply grooved. On each side of the petiole there are about 70 leaflets.

The division superintendent of schools for Bohol reports that this palm is used for hats. The petiole yields a material white in color, good for weavers, but not for spokes.

PALMA BRAVA.*(Livistona rotundifolia.)*

Palma brava (Sp., F.), (Pangasinan); abiang (Pangasinan); anaáo, labig (Il.); anahao (Albay, (T.) Laguna, Tayabas); anan, ballang (Cagayan); anao (Iban.); bagsang (Samar); bahi (Vis.); palmeto (E.).

The palm grows to a height of 15 to 20 m. The leaves are crowded together at the apex of the trunk. They are orbicular and comparatively large and consist of segments separated and pointed at the circumference. The petioles that support them are long and armed on the sides with hard sharp spines.

USES.

Wood.—Aside from a rather restricted use for furniture, the wood of this palm is utilized by wild tribes for bows and for carrying poles in the cities.

Leaves.—The leaves of this and related species are used in foreign countries for palm fans. In the Philippines they are made into salakots (round native unblocked hats) and into native raincoats. The segments are often separated and used the same as nipa thatch. The petioles of this palm have not yet been thoroughly tried out for industrial purposes.

NIPA PALM.*(Nipa fruticans.)*

Nipa (E., F.) (Antique, Cebu, Pampanga); sasá (T.) (Mindoro, Pampanga); lása (T.); sága (Zambales); tatá (Cagayan).

It is interesting to note the entire absence of a trunk in this palm and the presence of large leaves 5 to 10 m. long, supported on stout petioles. The male inflorescence is brown, erect, and up to 1 m. in height. The fruit is in the form of a large ball which breaks apart when ripe, liberating the seeds that float about over the water and finally settle in the mud and start to grow.

DISTRIBUTION.

Nipa palms occur throughout the Philippines along tidal streams and especially in swamps along the deltas of rivers. They are also found in India and from Malaya to Australia.



Reprint Phil. Journ. Sci., Vol. VI, No. 2.

NIPA FRUIT.

PREPARATION.

Splints.—Petiole splints are prepared from the petioles in the same way as other palms, but they are entirely unsuited for spokes, being too brittle. The middle-aged petioles may be utilized for weavers. The colors are not satisfactory.

USES.

Leaves.—The leaves of the nipa palm form one of the most common roof thatches in the Philippines. In the poorer type of houses they are also employed for the sides. They are used, too, for hats and raincoats, and can be woven into rough mats.

Midribs.—The midribs, when stripped from the leaflets, are used in making cheap brooms. They are also employed for certain types of trays and baskets.

Chapter VIII.—RATTANS.¹

The rattans are usually long, slender, climbing palms growing in the deep shade of dense tropical and subtropical forests. They are generally very local in their distribution, and a certain species abundant in one district may be entirely absent from another locality abounding in rattan palms. Ordinarily the palms have a single main stem without branches; but, if their growing point is injured, branches are formed. Young rattans generally have leaves with spines and thus can be easily distinguished from other young palms. Occasionally, as in Baliuag, Bulacan, a few rattan palms are found in a more or less cultivated state in yards and gardens at the homes of some of the people. In the Philippines two genera of rattans are important industrially; viz, *Calamus* and *Daemonorops*.

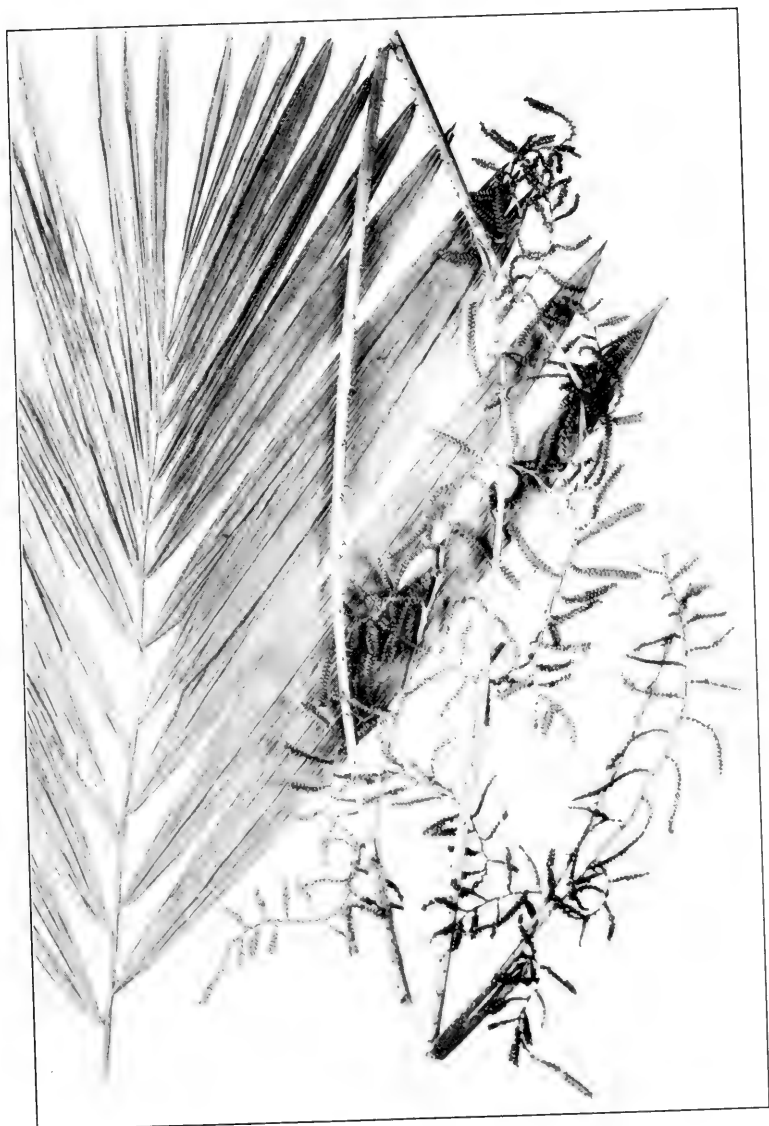
THE GENUS CALAMUS.

Species of rattan of the genus *Calamus* may be erect or scandent and a few feet or one hundred or more feet in length. As a rule, the stems are slender, of the same diameter throughout, and not much thicker than the little finger. With very few exceptions, all parts of the plant are abundantly supplied with spines. These may be long, straight, and narrow as on the leaf petiole, or like "prickles" as on the leaf surface. The slender spines become hard and rigid and often brown or black in color on the leaf sheath. Besides these spines and prickles mentioned, which serve mainly to protect the plant, other spines may be present—short, stout, and recurved like a cat's claws—occurring on whiplike ends (flagella) which enable the plant to attach itself to other forest plants and so reach the sunlight.

¹ The botanical description is based mainly on O. Beccari's treatise on *Calamus* and *Daemonorops* in the Annals of the Royal Botanical Garden, Calcutta, vols. 11 and 12.



A RATTAN SEEDLING.



From Annals of the Royal Botanical Garden, Calcutta.

CALAMUS MOLLIS (MALE INFLORESCENCE).

The leaves appear to be arranged alternately on the stem, due to the rapid growth of the internodes. That they really have a spiral arrangement may be determined by examining the crown of the plant. The whole leaf is of a feathery appearance and is made up of leaflets which vary in number for the different species. These leaflets are usually long and slender, though other types also occur. They diminish in width toward the petiole (rachis) and are attached to it by a very narrow base. The blades of the leaflets are fine in texture and although of the same green color on both sides, the upper surface is usually shiny and the lower dull. The basal portion of the leaf is called the leaf sheath and envelopes the stem completely so that the whole stem of the growing rattan is made up on the outside of these leaf sheaths.

At present about 17 species of *Calamus* are known in the Philippines. The most important commercially being *Calamus mollis* which is used in the manufacture of hats.

UAY.

(*Calamus mollis*.)

Uay (Bulacan, Cavite, Cebu, Bohol, Oriental Negros, Pangasinan); babuyan (Zambal in Zambales); bari (Iban.); barit (Il. in Tarlac, Union, Zambales); bejuco (Sp.); hanapas (Albay); oey (Pangasinan); tagalwa (Leyte); tagocan (Oriental Negros); yantoc (Cavite).

This plant is a slender, climbing palm from two to many meters in length and with stem from 10 to 12 mm. in diameter. The longer palms especially are armed with sharp, slender spines. The leaflets are from 40 to 80 cm. long and are made up of leaflets, the largest of which are 20 to 40 cm. in length and 20 to 25 mm. in width. The flowers are yellow and fragrant and the fruits are numerous, ellipsoid in shape, and about 1 cm. long.

PREPARATION.

Like all rattans, the stems of this species are easily prepared by removing with a sharp knife the leaf sheaths that surround them. The stems are then cleaned and cut off at the joints; the internodes being about 45 cm. in length

and 1 to 2 cm. in width and reddish or brown in color. These internodes are then dried, split into halves, quarters, and eighths, and the soft interior removed. The inside part of the splints is then further whittled down until they are very fine. They are then passed between a sharp blade and a smooth piece of glass, on which there is often a fine groove. By pulling the splints between the glass and the blade the reddish epidermis is removed. Unless great care is taken, the epidermis is not always entirely removed and this accounts for the dark streaks seen in rattan hats. The preparation of the splints requires skill and dexterity, for the fine fiber is easily broken when pulled under the knife.

USES.

Hats.—The chief use of this species of rattan is for the manufacture of hats. Owing to the fact that it often takes several months to make one rattan hat and that they must be woven preferably evenings or mornings, and because of the skill required to prepare the material, rattan hats are now seldom made and those that are made fetch high prices. Rattan hats are now made perhaps most frequently in Baliuag, Bulacan.

THE GENUS *DAEMONOROPS*.

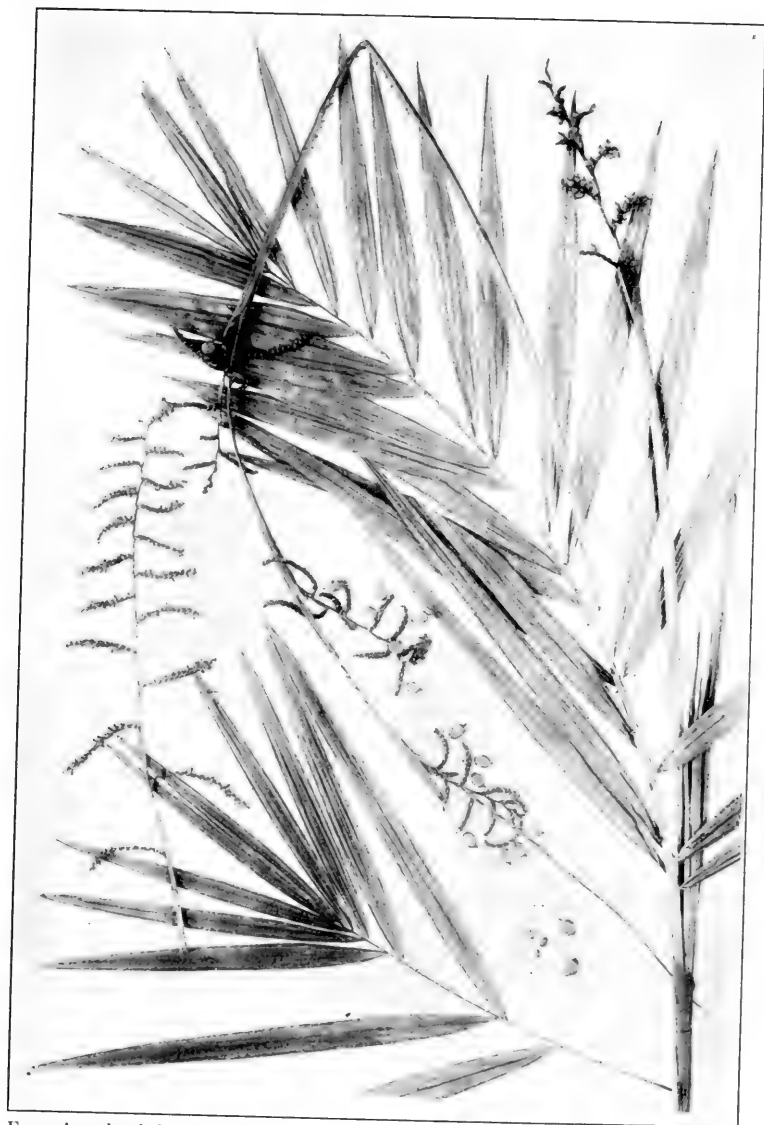
In many ways this genus is similar to *Calamus*. A few of the most important differences are the larger diameter of the stem and the fact that the leaf sheaths never bear whiplike ends. The leaf sheaths of the species *Calamus* may or may not have these whiplike processes. In *Daemonorops* the upper parts of the leaves always end in some sort of an appendage, while in *Calamus* such appendages are entirely absent. In *Daemonorops* the leaflets are usually narrow and pointed, while in *Calamus* they are variable.

SAMULIG.

(*Daemonorops gaudichaudii*.)

Samulig, lacaon, ouay babae, ouay na binabae, palasan, parasan, samulig, tikol (Sorsogon); bogbog (Tarlac); gatasan (Camarines, Capiz, Sorsogon); labnig (Albay, Sorsogon, Tayabas).

This species of rattan palm is more or less scandent or climbing. The sheathed stem is from 2 to 5 cm. in



From Annals of the Royal Botanical Garden, Calcutta.

CALAMUS MOLLIS (FEMALE INFLORESCENCE AND FRUIT).



From Annals of the Royal Botanical Garden, Calcutta.

DAEMONOROPS GAUDICHAUDII.

diameter. The leaves are 1.5 to 2 m. long, feathery in appearance, and supported on petioles about 20 to 40 cm. long. Each leaf is compound and made up of numerous leaflets; the larger ones being 35 to 45 cm. long and 15 to 25 cm. broad.

DISTRIBUTION.

This rattan is found in the dense forests of most parts of the Philippines. In former years it was collected in large quantities near the towns of Angat and Norzagaray, Bulacan. At the present time, owing to the indiscriminate way in which the palms were cut, very little rattan is found near the towns mentioned. A trip of two to three days far into the interior of the Negrito country is now necessary to obtain rattan of the diameter necessary for furniture making. It is for this reason that some of the rattan factories in San Miguel, Bulacan, procure their rattan from Iba, Zambales, and although the latter place is very distant from San Miguel, rattan can be bought cheaper from Iba than in Angat or Norzagaray, in spite of the much longer water and land transportation necessary.

PREPARATION:

The removal of the leaf sheaths makes the stem ready for use.

Framework.—For the making of the framework of chairs and similar articles, the rattan stalks are cut into the sizes necessary for the making of the various parts. They are then put and kept in steam for about ten minutes and transferred upon an iron mold of the desired shape and placed under a roller. The rattan being soft and pliable assumes the shape of the mold. The rattan is then tied to the mold and allowed to cool and harden. In order that the rattan may retain the shape of the mold permanently, both the mold and the rattan are placed in steam for about fifteen minutes. After cooling, the mold is removed and the rattan will retain the shape that has been given to it.

Cane seats.—For the seats of chairs, rattan of small diameter is used. It is divided into halves, quarters, and eighths and the inner part removed. The rattan splints are

then passed under a knife to make them of uniform thickness. After this operation they are passed between two knives to make them of uniform width.

Furniture.—The making of rattan furniture in the provinces north of Manila is of comparatively recent date. There are at present four rattan furniture factories in San Miguel, Bulacan; two in Baliuag, Bulacan; one in Angeles, Pampanga; and one in San Pedro Macati, Rizal.

In San Miguel, Bulacan, the workers receive 20 centavos for putting the parts of the chair together. A good laborer working from 7 in the morning until 6 at night can assemble seven chairs. The weaving of the seats is left to women who take them to their homes and receive 20 centavos apiece for their work. The cost of material is ₱13 per 100 pieces, and it takes about $3\frac{1}{2}$ pieces to make one chair.

Chapter IX.—VINES.¹

Many vines growing in the Tropics develop air roots high above the ground from long, clambering, fleshy stem structures. Due to the fact that they attach themselves to tree trunks and cliffs by means of small horizontal roots, an impression often prevails that they are parasites. They are not parasites, however, for their own underground roots and the air roots develop as the plants grow older, making the vines independent of other plants for their food supply.

Another very characteristic feature of tropical forests and jungles is the long ropelike vines that hang down from trees hindering or obstructing passage through the forest. These vines are often used by the hill people for tying purposes.

Vines usually rise above the ground by twining around an object or by clutching some support by means of tendrils. An example of a twining industrial vine is pamago and of one with tendrils, the vegetable sponge.

AIR ROOTS.

The air roots of many different species of aroids are now used in Philippine public schools as a foundation for coiled baskets and also, either bleached or unbleached, for the fabrication of various types of baskets. The hill people living in or near dense tropical forests have undoubtedly known air roots and have used them to some extent for tying purposes perhaps for ages, but it has remained for the public schools to prove that they are also suitable for other purposes.

These air roots were first tried for baskets in the schools

¹ A slight deviation will be made here from the alphabetical arrangement followed in other chapters, as it is advisable to group together all plants with air roots.

in the Bicol Peninsula¹ and their Bicol name, "amlong," has come into general school use. In the Bicol Provinces they speak of white, brown, and black amlong, implying that the part used—central part of the air root (central cylinder)—stays white or becomes brown or almost black in color after removal from the surrounding tissue.²

The length of these air roots varies; many of them are 15 m. or more long. They usually originate from various parts of the stem and grow toward the ground. Normally, they never branch, but if a root is injured new branches are formed above the injured or broken part. Because of the fact that the roots do not develop branches, they are preferred to jointed vines as a basketry material.

The leaves of aroids vary in length from 1 dm. to over 1 m. and are generally arranged alternately on a climbing stem several centimeters in diameter. They are rather thick, not as fleshy as the leaves of maguey, but considerably thicker than ordinary plant leaves. In many *Araceae* (the family to which amlong belongs) the leaves are at first entire, but later become deeply indented. Both stamens and pistils of the flowers may or may not be borne on the same thick, fleshy, fingerlike organ called a spadix. A kind of hood called a spathe usually surrounds the spadix.

In general, it is not difficult to recognize in the forest plants having air roots (aroids). It is, however, often hard

¹ THE PHILIPPINE CRAFTSMAN, Vol. I, No. 1, 1912, Philippine Baskets, page 12: "The manner in which these materials (air roots, certain vines, nito, irao, palm petioles) came to be used is interesting. The children in the public schools of Polangui, Albay, had been making bamboo baskets, as that was supposed to be the cheapest material and the one easiest of access. But as the ribs always broke at any point where they were sharply bent, teachers and pupils were urged to find some cheap material that would not have this fault. They began looking about and asking the older people. As a result certain air roots which had previously been employed as a tying material were found satisfactory for basket making. Banban was also brought into school use. When banban became scarce, it was found that palm petioles could be substituted for it. Polangui baskets have therefore derived their name from this town. Baskets of this type were gotten out in 1910 by a Filipino teacher, Pedro Espinas."

² An example of each kind will be briefly discussed under these colors for amlong.

to distinguish between one kind and another, as species are often based on minute but important structural characteristics of flowers and slight but typical variations in the venation and shape of the leaf. Then, too, aroids which grow on forest trees may have their leafy part a hundred feet or more above the ground. For this reason it is quite impossible to distinguish the various species on sight. It is therefore not of sufficient practical importance to describe separately each one of the species that are known to be used at present in the schools.¹

A description of the forest near Puerto Galera, Mindoro, where the writer found air roots in plenty, should prove of interest to those unfamiliar with the habitat of these aroids. A good half day's journey from town, amlong was found in fair quantity on the sides of heavily wooded mountains, but more plentiful in ravines or gulleys. In these places, bird's-nest ferns were very abundant and the bark of many trees was covered with moss. So humid were the surroundings that even the edges of many leaves were covered with fringes of moss. The trees and plants were so close together that only a little of the light of the sun was able to find its way to the ground through the dense mass of foliage. The earth even after a bright, sunny day was found damp late in the afternoon. The ground was covered with decaying vegetation. It was a country in which leeches, mosquitoes, and insects were plentiful. The forest trees grew to a great height. The leaves of amlong were around the upper part of the trunks of the trees and roots of various lengths dangled down from aroid stems.

¹ Amlong: *Pothos longifolius*: Hipan, oroola (Sorsogon); *Pothos ovatifolius*: Kalot-kagot (Albay, Camarines, Samar, Sorsogon), kalipkip (Tayabas); *Pothos philippinensis*: baladauan, oroolaypan (Albay, Bataan, Bulacan); *pothos rumphii* (Albay, Laguna, Mindoro, Oriental Negros); *raphidophora perkinsiae* (Benguet, Tayabas).

Black amlong: *Raphidophora merrillii*: amlong (Albay, Bohol, Sorsogon, Tarlac); amiling (Gad. in Nueva Vizcaya); amolong, gayaman kilat, maragayaman (Zambal); amuling (Il. in Nueva Vizcaya); bacog (Albay); balision (Isi. in Nueva Vizcaya); garusiba (Isabela); lukmoy (Batangas, Tayabas, Mindoro); takoling (Bohol, Cebu); tibatib (Cavite, Laguna).

White amlong: *Epipremnum elmerianum* (Leyte, Mindoro).

The question has been brought up whether the raising of amlong is feasible in towns where the supply of air roots for basketry is becoming scarce. As will be seen from the foregoing, air roots develop best in damp, dense tropical forests. While several species¹ of aroids producing air roots are found in cultivation or at least semicultivation in a number of Philippine towns, their development of air roots is rather poor and slow.

DESCRIPTION.

The tips of the air roots are generally from 2 to 5 m. from the ground and the roots are obtained by simply pulling them down. Depending on the strength of the pull and the luck of the gatherer, he will be able to obtain pieces of roots ranging in length from a few meters to 20 m. or more.

The roots are usually brown in color, often fuzzy, and covered exteriorly with a thin dead epidermis. This epidermis when removed reveals the living epidermis, green in color or sometimes white. Within this skin is the white succulent tissue called the cortex and within the cortex the central cylinder.

As is natural, the middle-aged roots produce the best material. In the very young roots the inner part, or central cylinder, is too soft to permit of its use as a commercial fiber. Old roots may be utilized although they are not as pliable as middle-aged roots.

PREPARATION.

The only part of the root which is of commercial importance and which is used in basketry is the inner part, or central cylinder. The central cylinder may be removed from the outer part—cortex and epidermis—by taking hold of it firmly and pulling it down. To do this deftly of course requires experience.

The central cylinder can be pulled out quicker by making a circular incision around the cortex or twisting the latter,

¹ Ex. *Raphidophora merrillii*, *Scindapsus aureus*. See also THE PHILIPPINE CRAFTSMAN, Vol. I, No. 4.



BLACK AMLONG (*Raphidophora merrillii*), SHOWING THICK, FLESHY, FINGERLIKE INFLORESCENCES.

about 2 cm. from the end of the root. The cylinder is then pulled down so that it emerges from one side only, thus breaking the cortex about 1 dm. in length. Then holding the root firmly against the stem of a tree, that can be conveniently encircled with the hand, the thumb of the left hand is interposed from above between the cylinder and the cortex. The cylinder is held tightly between the thumb and the tree while the right hand keeps on pulling the cylinder toward the body, the cortex falling to the ground. As soon as a piece of cylinder of sufficient length has been pulled out, it may be wound around the hand to give a firmer grip in pulling.

The process is best performed in the field immediately after collection, as the cylinder then pulls out easily from the cortex. It also saves one the burden of carrying home much useless material. In general, the hill people will have to be employed to collect and bring in this material.

USES.

Air roots furnish a strong, round, pliable material of small and even diameter which may be used in basketry either split or entire. Roots, or rather central cylinders, that are naturally white need no further preparation before being used. Amlong, either brown or black, may be kept that color or may be bleached as explained under "Brown amlong."

The roots may be used instead of the core of rattan for furniture purposes and as foundations on which to wind lupis, raffia, and other materials. Hand satchels and other objects made from round rattan can also be woven from air roots. The material in combination with nito is also suitable for lamp shades.

WHITE AMLONG.

(*Epipremnum elmerianum*.)

This species, belonging to the family of *Araceae*, has a central cylinder which, after being stripped of its surrounding tissue, stays white without any further preparation. If any species deserves the name of white amlong,

it is this one, although other species will probably be found in the course of time that may receive the name of white amlong with equal merit. Botanically the main difference between the genera *Epipremnum* and *Raphidophora* is not in the shape of the leaves, but in the structure of the flowers.

BROWN AMLONG.

(*Raphidophora copelandii*.)

(Benguet, Davao, Mindoro.)

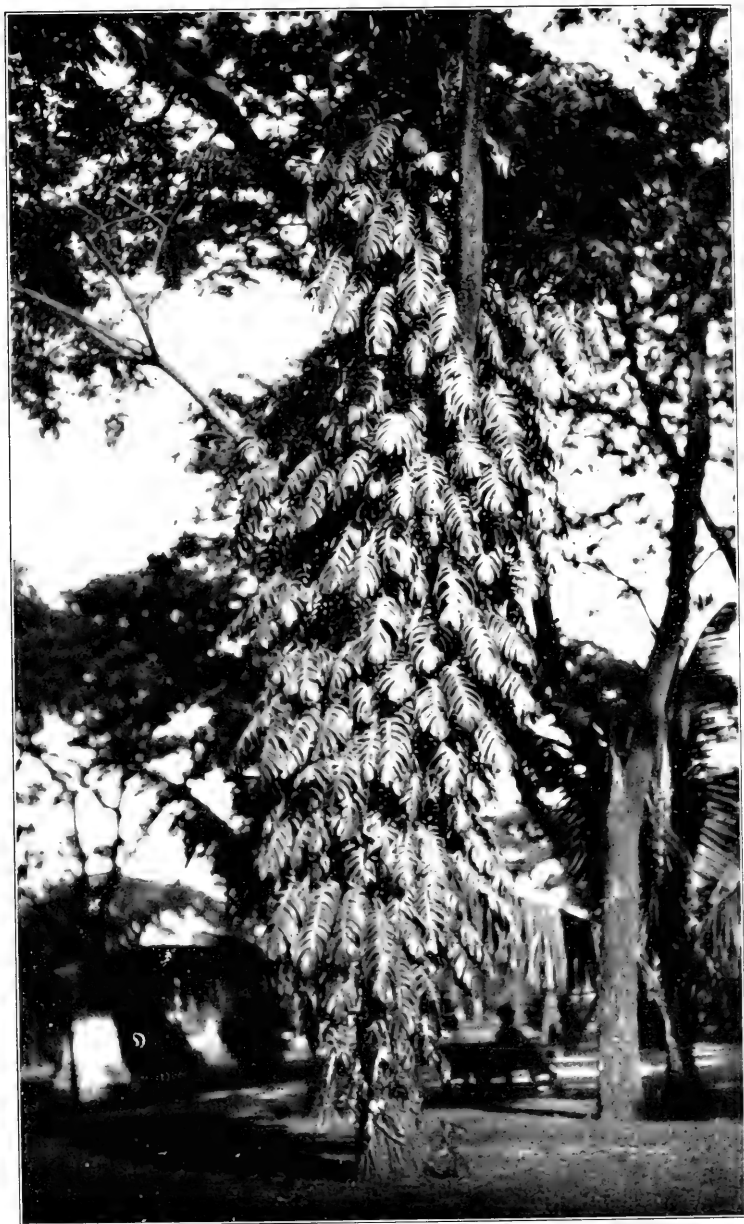
This species and *Raphidophora merrillii* appear at first sight to have leaves of similar form. However, a closer inspection of the segments and venation of the leaves reveals marked differences.

The young leaves of both this species and of *R. merrillii* are very different from their adult form. When young, the leaves are entire and continue to be so for quite a while; finally they become indented and assume a shape characteristic of many aroid leaves.

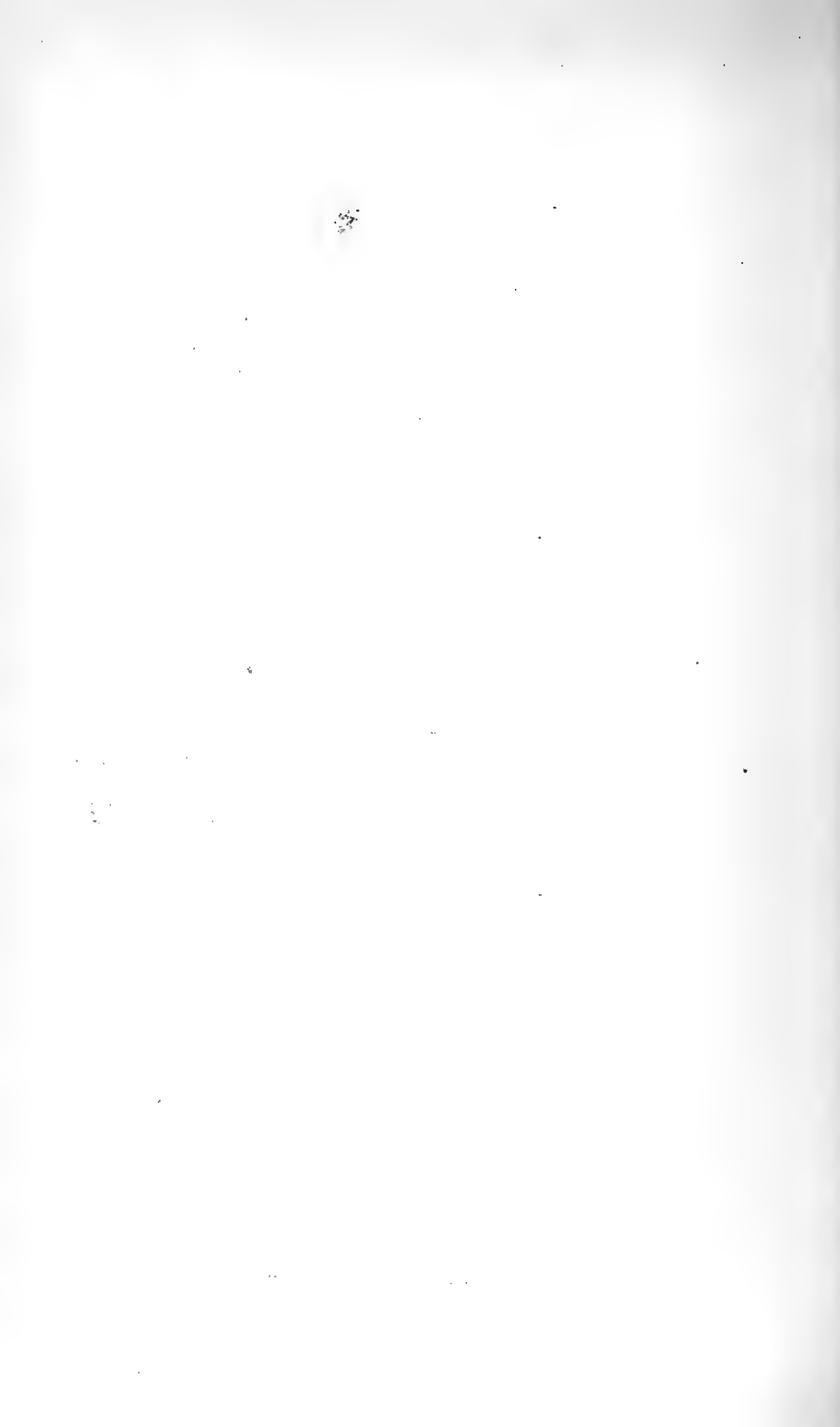
In *R. copelandii* the air roots occur near the axils of the leaves, while in *R. merrillii* the air roots are found on the lower part of the stem; the leaf of *R. copelandii* is also thinner than that of *R. merrillii*.

When an air root of the brown amlong plant is first stripped of its central cylinder, the latter is white in color but soon changes to brown on exposure to air. The color may be improved somewhat—that is, made lighter—by rubbing it soon after exposure with wet sand and drying it in the sun.

This brown amlong may be whitened by putting it in a solution of sodium peroxide. This solution is made up in the proportion of 2 tablespoonfuls of peroxide to 10 to 15 liters of water. It is best to keep this mixture in a glass vessel. The amlong is allowed to stay in the solution for twenty-four hours and it is then washed in clear, fresh water and hung out to dry in the sun for a day. This procedure is repeated three to four times, each time with a fresh solution of the peroxide.



BLACK AMLONG IN THE BOTANICAL GARDEN, MANILA, P. I.



BLACK AMLONG.¹*(Raphidophora merrillii.)*

The central cylinder of the root of this plant becomes very dark in color after removal from the tissue which surrounds it. It is the species commonly found in cultivation in Manila and in many towns in the provinces. The inflorescence (spadix) is like a fleshy finger, at first green and inconspicuous, but later becoming bright yellowish-red in color. Most of its air roots arise from the lower part of the stem. It is prepared the same as other air roots. It may be bleached like *R. copelandii*.

GOGO.*(Entada scandens.)*

Gogo or gúgo (T.) (Bulacan, Tayabas); balógo, balones (Vis.); balugo (Mindoro); barugo (Leyte); bayogo (Pampanga, T., Vis.); lipai (Abra, Ilocos Norte and Sur, Union); gohong báca (Pampanga, Vis.).

Brief mention is made here of a vine belonging to the family of the *Leguminosae*, which bears tendrils and has jointed pods from 60 to 70 cm. long and 7 to 10 cm. wide. The material (gogo) obtained from the vine is sold in almost all provision stores (tiendas) in every town and hamlet of the Philippines. It is most commonly used as a substitute for soap for washing the hair. It is occasionally employed like soap for cleaning the body, and at times is kept at the bottom of trunks to keep insects away.

HOAG.*(Flagellaria indica.)*

Hoag (B.) (Albay, Antique, Camarines, Capiz, Cebu, Iloilo, Sorsogon); annuad (Union); auni si gayang (Isi. in Nueva Vizcaya); balingway (Laguna, Mindoro, Nueva Ecija, Rizal, Tayabas); bulokawi (Cebu, Mindoro); caluuauay (Cagayan); hoag-oay (Sorsogon); inuad (Il. in Pangasinan); inual (Pang. in Pangasinan); oay ti oac (Il. in Isabela); sagakap (Capiz); tewung, kaliwayway (Iban. in Isabela); uenag ayang annuad (Il. in Nueva Vizcaya).

¹ See also air roots and brown amlong.

A plant often erroneously spoken of as a kind of rattan is *Flagellaria indica*, commonly known as "hoag." This plant is very distinct, botanically, from rattan, though it is often used like the latter.

Hoag is a vine, with the lower part of the stem as thick as a man's thumb. Spines are absent. The leaves are lanceolate in form, without petioles, and ensheath the stem as do blades of grass. The tips end in coiled tendrils. The flowers are sessile and clustered in the form of a panicle. The fruit is red.

DISTRIBUTION.

The plant is widely distributed throughout the Philippines and common in the forest and along streams.

PREPARATION.

Prepared the same way as rattan.

USES.

Hoag is used for tying purposes. Reports say that it can be used for rims of baskets and that it may be used for weavers and spokes where better materials are not available.

VEGETABLE SPONGE.

(*Luffa cylindrica*.)

Vegetable sponge (E.); kabatiti (Il.); loofah (E.); patola (T., Vis.); tabongas (Pampanga, Pangasinan); tabubuk (Bulacan, Tarlac).

The stem of this vine bears tendrils and is distinctly five-sided. The leaves are rough to the touch, shallowly 5 to 7 angled or lobed, and about 10 to 20 cm. in diameter. The flowers are yellow. The fruit of the cultivated vine is in appearance like a long cucumber, at first fleshy but finally becoming stringy; that of the wild variety is always fibrous.

DISTRIBUTION.

The vine is commonly cultivated for its fruit and also found growing wild near streams and around trees and hedges throughout the Philippines.



PAMAGO (*Pericampylus incanus*).

PREPARATION.

The network of interlacing fibers in the fruit are easily removed by hand from their surrounding tissue. If the fruit is picked while green, the fibers are white in color but become yellow on drying. In Bulacan the fibers are first washed with soap and water before being placed in the sun.

USES.

Especially in Abra and Bulacan, vegetable sponge fibers are occasionally used for hats. There is nothing beautiful, serviceable, nor artistic about these hats, and the only thing than can possibly be said in their favor is that they are rather novel.

The fibers are employed commercially in the manufacture of articles for the bath. Large factories in Germany import the fiber from Japan and manufacture it into gloves, straps, soap holders, and pads. In these articles either the fiber alone is used, or it is sewn on to cotton or flannel goods. The fibers of the vegetable sponge are well adapted also for bath slippers, sandals, mats, scrubbing brushes, and similar articles. They may be considered also a good substitute for the more expensive sea sponges, and their use for a "rubdown" is said to be of therapeutic value.

PAMAGO.

(*Pericampylus incanus*.)

Pamago (Albay, Camarines, Sorsogon); silong pugo (Batangas); tugui-tuguian (Mindoro). Collected also by B. of S. in Benguet, Davao, Laguna, Leyte, Palawan, Rizal, Zamboanga.

This plant is a member of the family of *Menispermaceae*. Most members of this family are typical tropical twining plants, being well represented in all tropical countries, but very sparingly in temperate regions.

The leaves of this vine are smooth and velvety to the touch; in shape, like a conventional heart; dark-green in color on the upper surface and grayish-green on the lower. They are not shed periodically nor renewed at any special time. The main veins are generally five in number, pal-

mately arranged and arise from the dent of the heart. The petiole supporting the leaf is fairly long and hairy.

The plant twines around other plants for support. It never develops prop roots. The small male and female flowers are never borne on the same plant. The fruit is small.

DISTRIBUTION.

The plant is generally found in thickets, waste places, or along the banks of streams and irrigation ditches in many places throughout the Philippines.

PREPARATION.

The best material is obtained from the older portion of the vine, which is bare of leaves.

The most expedient way to prepare the material is to boil the stem for about two hours. The outer layer with its adhering tissue is then easily separated from the inner part and thrown away. The material is then dried in the sun and smoothed with sand paper. It is yellowish white in color and from 2.5 to 3.5 mm. in diameter.

The Albay Industrial Bulletin No. 4 of December 5, 1911, gives two other methods of preparing the stem which result in a whiter and stronger material, but require more time:

Remove the bark without boiling in the same way as is done with bacog (air roots). This method requires very careful work as the bark breaks easily.

Scrape off the bark without boiling the material, being careful not to injure the woody part. Dry in the sun and sandpaper well.

USES.

Pamago is a good material for weavers of baskets.

Chapter X.—PLANTS WITH LEAF OR PETIOLE FIBERS OF COMMERCIAL VALUE.

There are various species of plants belonging to different families that have fleshy leaves or fleshy petioles from which excellent fibers are extracted. Examples of leaf fibers are maguey and pineapple; and of petiole fibers, abaca and banana. Maguey fibers are usually extracted by retting and pineapple fibers by scraping the leaves with broken pieces of pottery; abaca and banana fibers are obtained by drawing the stalks under a dull knife on which considerable pressure is exerted.

MAGUEY.

(*Agave cantula*.)

Maguey (E.).

There are several species of *Agave* that yield the fiber known to commerce as maguey or sisal. Of these, *Agave cantula* is the species commonly cultivated in the Philippines. *Agave rigida sisalana* from the Hawaiian Islands was introduced into the Philippines a few years ago and its cultivation has spread to many provinces throughout the Archipelago.¹

The species all agree in being rather coarse plants and in having usually very short stems. They thrive in poor soil where other plants would not even get a start. The leaves persist for a number of years and are thick and fleshy and provided along their margins with sharp, stout, prominent spines.

Maguey, especially the species *A. americana*, was formerly supposed to bloom just once in a hundred years and received on that account the name of century plant. It is

¹ "The Cultivation of Maguey in the Philippine Islands," B. of Agri., Bulletin No. 13.

now known to blossom when it gets to be between 8 to 12 years old. The flower stalks are 4 m. or more in height, arborescent in form, and have stout branches which usually bear green flowers.

PREPARATION.

In the Philippines, the fibers are usually retted—that is, the leaves are cut off and put in salt water until the soft tissues surrounding the fibers have decayed. The fibers are then washed and dried in the sun. A more laborious way, resulting, however, in the production of a finer grade of fiber, consists in scraping the leaves and then washing and drying them in the usual way.

USES.

In the United States maguey is used extensively for binder twine. The fiber is also used for cordage, fish nets, hammocks, and similar purposes. In several provinces in the Philippines the fiber is woven in a limited quantity into cloth. Several years ago the export of maguey was of considerable importance in the Ilocano territory, which, because of its soil and long dry season, is well adapted to the growing of this fiber. The planting of maguey at present fluctuates, depending on the demand and the price paid for the fiber.

Maguey fibers are braided and employed for soles of “alparagatas.” These are slippers having usually heavy maguey soles and canvas or cloth uppers and are used by Filipinos and others in place of shoes, especially when tramping over hills. The slippers are at present imported into the Philippines from China and Japan, but there is no valid reason why they should not be made more extensively in the Islands.

The schools of Ilocos Norte are putting out a very serviceable and neat house slipper having a macramé toe of maguey fiber, under sole of braided maguey, and upper sole of rice straw.

The fiber twisted or as cord can be used for making neat and attractive coiled baskets.



Courtesy of Bureau of Agriculture.

MAGUEY IN FLOWER.

PIÑA.

(*Ananas sativus*.)

Piña (Sp., F.); malisa (Camarines); pineapple (E.); pita (Il.).

Piña cloth is made from the leaves of the pineapple plant. In the Philippines the plant may be found in cultivation in almost all inhabited parts of the Islands, but generally in very limited quantities in any one place. The fruit is too well known to need description. The leaves are long, lance-like in form, from 1 to 1.5 m. in length and 5 to 7 cm. in width.

PREPARATION.

The process of preparing the fibers for industrial purposes varies in minor details in different provinces. In the main, it consists in removing the spines from the sides of the leaf and scraping the latter with a blunt object of some kind, such as a piece of pottery, bamboo, iron, and the like. A knife would be too sharp and would cut the fibers too easily. The particles of pulp adhering to the fibers are generally removed with the finger nail and the material is then washed in water and hung up to dry. Fibers of the same thickness are then tied together much in the same way as is done with abaca.

USES.

Pineapple fibers may be woven into a rather coarse gauzy fabric (sinamay) or into a very fine textile (piña). This piña is often delicately embroidered and made into exquisite centerpieces, doilies, handkerchiefs, and other articles.

At present the demand for a fine grade of piña is greater than the supply. Pure piña washes and wears well. It is often mixed, however, with banana fibers. These latter weaken the fabric as they break more easily than pineapple fibers. Banana fibers, too, become darker in color with each successive washing.

ABACA.

(*Musa textilis*.)

Abaca (F., Sp.); Manila hemp.

In appearance, abaca closely resembles the banana plant, but may be distinguished from it by its narrower leaves.

The true stem of the abaca plant is that part of the plant which has a diameter of about 5 cm. and bears the fruit. The trunk of the abaca plant is formed by this true stem and the thickened petioles of the leaves. The fruit of the abaca is a banana, small, inedible, and full of seeds.

PREPARATION.

Fiber.—As the abaca plant reaches maturity, it produces suckers; so when an old plant is cut down, the young ones already have a good start. The leafy part on top, being of no value, is cut off and allowed to rot and enrich the soil.

The petioles are separated one from the other and split into strips. These strips are pulled under a knife resting on a block. The knife is worked by a crude spring. The cutting and stripping of the fiber should be done within twenty-four hours, as the petioles deteriorate rapidly. If a serrated knife is employed, stripping is easier, but the fiber is not as white and fine as when a knife with an even edge is used. In some localities in the Islands (Indang and Alfonso, Cavite) which produce a very white, lustrous abaca fiber, a part of the pulp is allowed to remain on the skin (*lupis*) which is to be pulled under the knife. In most abaca regions, however, much of the inner pulpy part is removed and only the outer part (*lupis*) is put under the knife.¹ The fibers are then hung on a pole and dried in the sun. The quicker the drying, the whiter the fiber. Boiling abaca fiber for from ten to twenty minutes is said to give it a better sheen.

LUPIS.

Lupis is prepared from the fleshy petioles of the leaves which form the trunk or false stem of the abaca plant.

When the trunk is cut down, the leafy part is removed and the petioles are separated one from the other. A petiole is then thrown down so that its outer surface is next to the ground. The foot is put on the inner surface near one end, and the other longer end flopped over. Then the

¹ See also THE PHILIPPINE CRAFTSMAN, Vol. I, No. 9, 1912: Two Methods of Stripping Abacá.



PINEAPPLES.

operator bends down, grasping with the right hand the whole strip on the outside near the ground, and then gradually rises, pushing the petiole outward and upward while at the same time the left hand is passed along the inside so as to flatten the petiole.

Starting near the upper third of the petiole, a diagonal cut is made across its width through the inner skin and pulp stopping at the outside skin, which later forms the lupis. Then, with the left hand on the outer sheath, the right hand carefully and slowly at first removes the pulp and the inner skin. The left hand is now passed more rapidly down the length of the sheath, and the right hand at the same time quickly pulls off the rest of the pulp.

About halfway along the length of the strip of lupis, the whole skin is split by the finger nail into strips one-half an inch or less in width. Beginning on the left side, the alternate strips are taken up by the left hand and the remaining alternate strips by the right hand. Then the hands are spread apart, and all of these strips are separated from each other by one movement.

The strips ought to be hung immediately in the sun to dry, for moisture or slow drying will cause discoloration of the lupis. All of the petioles except the inner few may be used in the preparation of the lupis.

Quick drying produces white lupis; slow drying or the use of old petioles, brown lupis of different shades.

USES.

Rope.—The chief use of abaca is as a cordage fiber. The conclusion should not, however, be drawn from this statement that it is the only good use to which it can be put.

Tied or knotted abaca.—The tying of abaca fiber for export is an important industry in Cavite, Batangas, and certain other localities. The export of this fiber amounted to over ₱1,000,000 in 1911. In the Bicol Provinces the fiber is softened by pounding before being tied. In a number of places the knotted fiber is woven into cloth. The tied fiber, twisted into fine cord, is also suited to various kinds of fancy work and coiled baskets.

Sinamay.—The term “sinamay” is often used in connection with abaca. The word simply means a gauzy fabric. Besides abaca sinamay there are also others, as for example pineapple, maguey, and banana sinamay.

Abaca sinamay is used by Filipino women for waists (camisas) or, like buckram, to stiffen the bottoms of skirts. Occasionally, the skirt itself is made out of the sinamay. Blocked sinamay hats are seen at times in Filipino hat stores.

Pinolpog.—Abaca cloth can be softened by winding it around a piece of wood and beating it thoroughly with sticks as it is being wound. The fabric is then called pinolpog in Visayan and pinokpok in Tagalog. Pinolpog in various colors can be neatly embroidered and made into pretty hand bags. The material is also very suitable for cushions. These can be decorated with abaca braid and in many other ways.

Tagal braid.—It is only within very recent years that factories have been established in Manila to manufacture abaca braid out of the knotted abaca fiber. The process of manufacture consists in winding the knotted abaca, which is usually sold in hanks, upon spools and then making it into braid by machines. The width of the braid depends on the number of spools in the machine, and the number of fibers wound at one time on each spool.

A considerable number of these machines are in operation in abaca-braid manufactories established in Malabon, Rizal, and Manila. A braiding machine of 13 spools is on exhibition in the industrial museum of the Bureau of Education. (See also THE PHILIPPINE CRAFTSMAN, VOL. I, No. 2, 1912.)

The chief use of the braid is for ladies' hats, which are made in Europe by sewing the strands of braid together. Hats, especially for women, made by weaving the braid as is done with bamboo and buntal fibers are very attractive and will probably find a good market when they become more generally known.

Slippers.—The abaca fiber is used either natural or colored in the manufacture of slippers. The first abaca slippers attempted in schools were often made with plush



Courtesy of Bureau of Agriculture.

ABACA (*Musa textilis*).

straps. This last feature is entirely eliminated in later styles, for an abaca top in some form or other is not only cheaper but superior in appearance and in wearing qualities. The uppers are now made in a fancy lace style, especially for ladies' slippers, or with macramé uppers or straps. The public schools in Sorsogon Province are putting out an all-abaca slipper in which even the filler between the upper and lower sole is an abaca sheath. The sheaths of areca nut and bamboo are, however, also serviceable as a filler. The bottoms of abaca slippers are either of braided abaca or leather.

Coiled baskets.—These are made on a single or multiple foundation from the loose abaca fiber or cord.

Bags.—Various styles of bags are made from the abaca fiber. Some of the bags are worked in a pure macramé weave while others are made as is Irish crochet, Teneriffe lace, or other forms of needlework.

Lace.—Bobbin and Battenburg lace have been made successfully from abaca fiber.

Lamp shades and belts.—These are made in the public schools from abaca fiber, employing the macramé weave.

Matting.—Very strong matting can be made from abaca cord.

Lupis hats.—Hats made from abaca lupis are very strong. Depending on the width of the fiber used and the care taken in its preparation and weaving, these hats are fine or coarse. They are woven in the natural color which for a stylish hat cannot be considered satisfactory. Because of their excellent wearing qualities, however, experiments in bleaching the fiber would be worth trying.

Lupis furniture.—The pupils in the farm school at Indang, Cavite, are turning out chairs, settees, and other articles of furniture made out of brown lupis which at most plantations is usually thrown away. Bamboo forms the foundation for the furniture, and the lupis, either braided or twisted, is wound around the bamboo framework.

The chief merits of lupis lie in its strength and the color effects that can be obtained. The tannic acid in the material would tend also to keep out vermin.

Lupis trays and baskets.—Trays and baskets are made out of lupis. These are either of a uniform light-brown or very dark-brown color or a combination of the two.

Lupis matting.—Lupis woven into matting has been pronounced by experts to be stronger than any other matting known.

BANANA.

(*Musa paradisiaca.*)

Several varieties of species of banana are utilized in the manufacture of sinamay. The fiber is prepared in the same way as abaca. Greater care is, however, necessary in its extraction from the petioles, as the fiber breaks more readily than does abaca.

Banana sinamay is in great demand by Filipino women for dress material. It is coarse or fine, depending on the quality of the fiber used. The material has a beautiful sheen; and if not entirely plain, stripes or plaids are the usual designs adopted. Bohol, Cebu, and Panay are the principal islands in which banana sinamay is woven. In the schools banana fiber has been used for coiled baskets in combination with buri raffia.

BOWSTRING HEMP.

(*Sansevieria zeylanica.*)

Bowstring hemp (E.); aspeaspe (Pampanga); banyat (Isinay in Nueva Vizcaya); bontot palos (Tayabas); cakarohay, pacarohay (Iban.); callot (Il. in Nueva Vizcaya); culebra (Sp.); lengua de tigre (Sorsogon); rabo de leon (Ilocos Norte, Union); rabo de tigre (Antique); sabila (Iloilo); sigre (Gad. in Nueva Vizcaya); sinawa (Nueva Ecija); tigre (F.) (Bohol, Laguna); tigui (Il. in Isabela).

The plant is an herb that grows up from a fleshy root stalk and bears the peculiarly mottled leaves that are on the average from 30 to 60 cm. long.

DISTRIBUTION.

Bowstring hemp is common throughout the Philippines, being grown mostly for ornamental purposes.



FLOWER BUD, FLOWERS, AND FRUIT OF THE BANANA PLANT.

PREPARATION.

The leaves are put in water for about a week. The fibers can then be obtained by pounding the leaves and removing the pulp. Rinsing and drying the fibers complete their preparation. At other times, the fibers are obtained like those from pineapple leaves.

USES.

The commercial importance of the fibers is not great, for they are utilized only occasionally. The fibers are not easily obtained and their shortness counts against them. The fineness of the fiber, however, and their good tensile strength are points in their favor. They are sometimes mixed with piña fibers in weaving fabrics.

Chapter XI.—MISCELLANEOUS INDUSTRIAL FIBERS.

(a) FIBERS SURROUNDING SEEDS.

Under this caption are included finely matted fibers such as occur in the boll of the cotton plant or in the cylindrical pod of the kapok or silk-cotton tree. In the cotton boll the fibers are more intimately connected with the seeds than in the kapok pod. The separation of the seed from its surrounding fibers by hand is therefore extremely difficult in the one case, while in the other it can be done with comparative ease.

KAPOK.

(*Ceiba pentandra*.)

Kapok (E.); balios, kapak, bulak (Bulacan); boby, bubuy, bulak, bulaksino (T.); bulak-castila (Pampanga); bulak-dondol, dondol (Cebu); capas, kapas-sanglay (Il.); doldol, kayo (Vis.); kapak (Rizal).

The kapok tree is found in all provinces of the Philippines, but its silky cottonlike fibers are gathered for trade or export principally in the Visayas. Most of the exported kapok floss from the Philippines finds its way to the markets of Hongkong and the Netherlands.

The tree is rather short, being generally less than 15 m. in height. The trunk is cylindric and has large spines scattered about its surface. It bears branches at right angles to the stem. The tree is usually propagated by cuttings. The simple, entire leaflets, from 5 to 8 in number and from 6 to 15 cm. long, are arranged on a long petiole. The flowers are numerous and whitish in color. The fruit is an oblong capsule about 15 cm. long and 5 cm. thick and filled with seeds loosely surrounded by fine silky hairs. These hairs are short and elastic.

PREPARATION.

In the Philippines the fibers are generally obtained by hand. In Java very simple kapok-cleaning machines are used, plans and specifications of which can be obtained at the Bureau of Agriculture, Manila, P. I.



KAPOK (*Ceiba pentandra*).

When the tree is in fruit, it is almost entirely bare of leaves.

USES.

Kapok fibers are chiefly used as filling material for mattresses, pillows, cushions, and life preservers. It is an excellent material for filling mattresses, as the fibers do not mat and will make lighter mattresses than any other good filling fiber known. As a filler in life-saving appliances it can sustain 20 to 30 times its own weight while horsehair and cork can only hold up 11 and 6 times their own weight, respectively. Even after being thoroughly water-soaked it maintains its favorable ratio to horsehair and cork.

Kapok oil is of value for soap, fuel, fodder, and manure.

COTTON.

(*Gossypium* spp.)

The species of cotton most cultivated in the Philippines are *Gossypium brasiliense* and *G. paniculatum*.

The chief cotton region in these Islands is the Province of Ilocos Norte. The method of gathering the cotton and preparing it for weaving is extremely simple; the various processes being performed by hand with the aid of crude and most primitive kinds of machinery. To a less extent, yarn is also made from home-grown cotton in the provinces of Ilocos Sur and Union.

The value of cotton cloths woven on the foot looms of the Ilocano Provinces is considerable. The Ilocano weaving is the most persistent survival of a Philippine cotton industry which was at one time very large and general. Though in many ways inferior, the imported machine-made yarns are lessening the amount of yarn spun from home-grown fiber. Isolated remnants of the weaving industry exist in such districts as Taal and Lemery in Batangas Province and on the islands of Cebu, Bohol, and Panay, where some locally made yarn is used, and in Leon, Iloilo, where all the yarn woven is imported.

(b) IRAO AND BANBAN.

Though widely separated botanically, two fibers are here brought together that could not be included in the chapters on ferns, grasses, and other plants. The outer parts of the

stems of these plants are used in industrial work. One is a plant growing in moist localities, the other an orchid found on trees.

IRAO.

(*Dendrobium crumenatum.*)

Irao (Camarines, Albay, Sorsogon); caramosi (Ilocos Sur); karonsi (Ilocos Norte); karausi (Cagayan); karulay (Isabela); magimpal, magimpao (Bohol); manano (Leyte); sangumay (Laguna).

The stalk of this orchid is about 60 cm. or more long and for a distance of about 20 cm. at the base is bulbous and fluted. The joints are usually from 1 to 2 cm. apart. The leaves are small and more or less oval in shape.

DISTRIBUTION.

The plant is of rather common occurrence and widely distributed in the Philippines.

PREPARATION.

The stalks of irao are cut when they are only partly yellow in the living specimen. If cutting is deferred until the whole stalk is dead and yellow, the material is very brittle. To make the stalks of an even bright-yellow color, they are placed for a short time in boiling water or in water to which a little vinegar has been added. Exposing the cut stalks to the sun produces the same result. The stem should be split through the scars that mark the attachment of leaves.

USES.

Irao is a decorative material. It is used for this purpose on baskets and whips of various kinds.

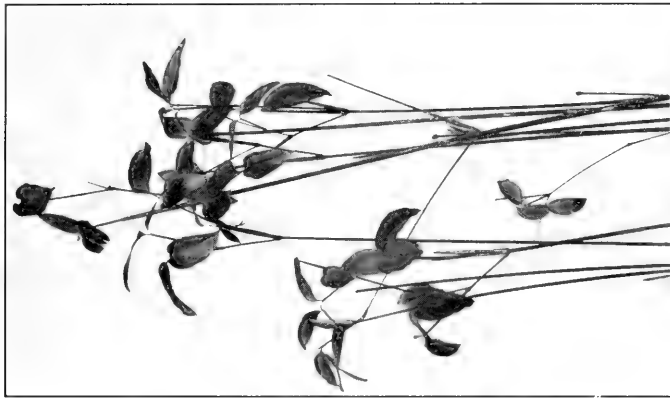
BANBAN.

(*Donax cannaeformis.*)

Banban (T.) (Albay, Antique, Bohol, Cagayan, Capiz, Cavite, Iloilo, Laguna, Mindoro, Occidental Negros, Oriental Negros, Palawan, Pampanga, Sorsogon, Tarlac, Tayabas); aratan (Gad. in Nueva Vizcaya); bamban (Camarines, Cebu, Sorsogon); barasbarasan (T.); daromaka (Il. in Tarlac); darumaka (Union, Il. in Nueva Vizcaya, Zambales); langkuas (Il.); manban (Leyte); mattapal (Isi. in Nueva Vizcaya).



IRAQ (*Dendrobium crumenatum*).



BANBAN (*Donax cannaefornis*).



The plant generally has a solitary stem arising from the ground. About 1 to 2 m. from the ground in the adult form, it shows a division into three or more branches and each one of these branches is divided and is like the main stem. Varying with the locality and richness of the soil, it grows to be 4 to 5 m. or even higher. The somewhat bulbous nature of the joints is peculiar; there being quite a thickening where the branches originate.

The flowers are white, about 3 cm. long with a calyx tube 1 cm. long. They form a panicle. The fruit is round, about 1 cm. thick, and contains one seed. The latter is oblong and rather strongly wrinkled. The ovate leaves are thin and smooth, from 15 to 18 cm. long and 9 cm. wide. The veins are parallel.

DISTRIBUTION.

Banban is very common and widely distributed throughout the Philippines. It also occurs in Java, Celebes, to New Guinea. It is generally found growing along the sides of streams or brooks and in moist, shady places.

PREPARATION.

The main stem of banban, because of its long internode, is the best part of the plant to use. This is divided into halves and quarters. The inner part is whittled down to the requisite thinness as is done with palm petioles. If the skin is not scraped off the material is of a pale-green or gray color; and if the epidermis is removed, the material varies from light to dark brown, depending on the age of the stem. The material is considered better for weavers than for spokes.

USES.

Banban is used for weavers of baskets, usually in combination with nito, irao, and other material. It is also used occasionally by Filipinos for hammocks, fish traps, hats, and for sewing together nipa leaves to be used as shingles.

Chapter XII.—PHILIPPINE BAST FIBERS.

The strong woody fiber obtained from the inner bark of various trees is known as bast.

There are a great many species of plants in the Philippines belonging especially to the family of *Tiliaceae*, of which jute is an important member; the *Malvaceae*, to which the cotton plant belongs; and the *Sterculiaceae*, of which the cacao plant is the best-known representative, that yield bast fibers suitable for rope. There are, however, many other families of plants whose bast fibers are also employed as a cordage material.

No attempt will be made to describe all of the bast fibers that are or could be utilized in the Philippines. Most of these fibers may be said to be of purely local importance at present, being made into cordage at home whenever such is necessary or desired. Some of the fibers have, however, distinct industrial or commercial possibilities and are therefore described here.

The preparation of bast fibers in general follows the processes outlined under jute. Where special methods exist, they are mentioned when the fiber is discussed.

THE ANILAO FAMILY (*Tiliaceae*).

The family of *Anilao* comprises a number of species that produce bast fibers utilized for rope. The members of this family are trees, shrubs, or herbs. The leaves of all species are always simple and entire and their margin either serrated or lobed. Flowers are perfect (i. e., each has stamens and pistils) and they are found in the axils of leaves or at the end of branches. Sepals and petals are from 3 to 5 in number. The inflorescence is generally a flat-topped or convex flower cluster or may be more irregular in outline because of branching. The fruit may be dry or fleshy. The most commonly used species are jute, anilao, danglin, and balitnong.

JUTE.

(*Corchorus* spp.: *C. acutangulus*, *C. capsularis*, *C. olitorius*.)

There are three species of jute that grow wild in the Philippines. They are not considered here separately, as from all of them a commercial fiber can be obtained. The species are all annual herbs varying in height from 0.5 to 2 m. They all agree in having yellow flowers and generally two bristlelike appendages at the base of the leaves. The margins of the leaves are serrated, but the shape of the leaves differs for the various species. All the species have receptacles for seeds, but in *C. capsularis* it is in the form of a capsule more or less round, very wrinkled, and about 1 cm. in diameter. In *C. acutangulus* this receptacle is a cylinder about 2 to 3 cm. long, 6 to 8 ribbed, and having 3 or 4 erect or divergent beaks, while the cylindrical capsule in *C. olitorius* is about 3 to 3.5 cm. long, 10-ribbed, and provided with a beak that is entire.

DISTRIBUTION.

The species are found in waste places, usually in wet or damp land; also near rice fields throughout the Philippines.

PREPARATION.

The outer bark and bast are removed together from the stem; the bark is stripped off and the bast is dried in the sun for about two days. The fibers are also prepared by leaving the bast in the water for about a week and then drying it in the sun. The first process results in a vine-like rope, while the second permits of the fabrication of a more fibrous cordage material.

USES.

At present jute is used in the Philippines only for rope and is never planted by the Filipino farmer. It would probably pay to raise the fiber, as there is a good market for jute in the United States which imports yearly thousands of tons worth millions of pesos. Gunny sacks and coarse fabrics (burlap) for packing or upholstery are also woven of jute. It is sometimes used as an adulterant in silk fabrics.

The fibers, though fine and silky in appearance, are weak and are easily disintegrated by moisture. Still their employment is advisable where cheapness rather than strength is the prime requisite.

ANILAO.

(*Columbia serratifolia*.)

Anilao (T.) (Bulacan, Capiz, Iloilo, Nueva Ecija, Occidental Negros); keddeng (Il. in Isabela); panaguising (Iban. in Isabela); sargo (Occidental Negros).

This shrub or small tree, from 3 to 10 m. high, is widely distributed throughout the Philippines. The leaf is from 10 to 20 cm. long; its base very oblique, its margins coarsely or finely serrated, and its undersurface smooth and velvety. The petals of the flowers are pink and yellowish or reddish. The plant is in bloom from May to July.

DANGLIN.

(*Grewia multiflora*.)

Danglin (T.) (Batangas, Bataan, Nueva Ecija); alinao (Amburayan, Ilocos Sur, Pangasinan, Sorsogon, Union, Zambales); al-alinao (Union); aplit (Pampanga); dallag (Gad. in Nueva Vizcaya); dangli, kalit-kalit (Tayabas); langosig (Bohol); lanut (Negrito in Pampanga); nagling (Pampanga); siapo (Mindoro); taroy (Albay, Camarines).

This shrub or small tree is seldom more than 8 m. high. The leaves are more or less ovate in shape, from 4 to 14 cm. long, and between 2.5 to 5 cm. wide. The base of the leaves is usually rounded and the margins are finely serrated. The plant is found in thickets throughout the Philippines. It bears greenish-yellow flowers from September to December.

BALITNONG.

(*Grewia negrosensis*.)

Balitnong (Capiz, Ilocos Norte); kanas-kanas (Batangas); queddeng (Abra, Union).

This species is closely related to *Grewia multiflora* and is also used for rope.

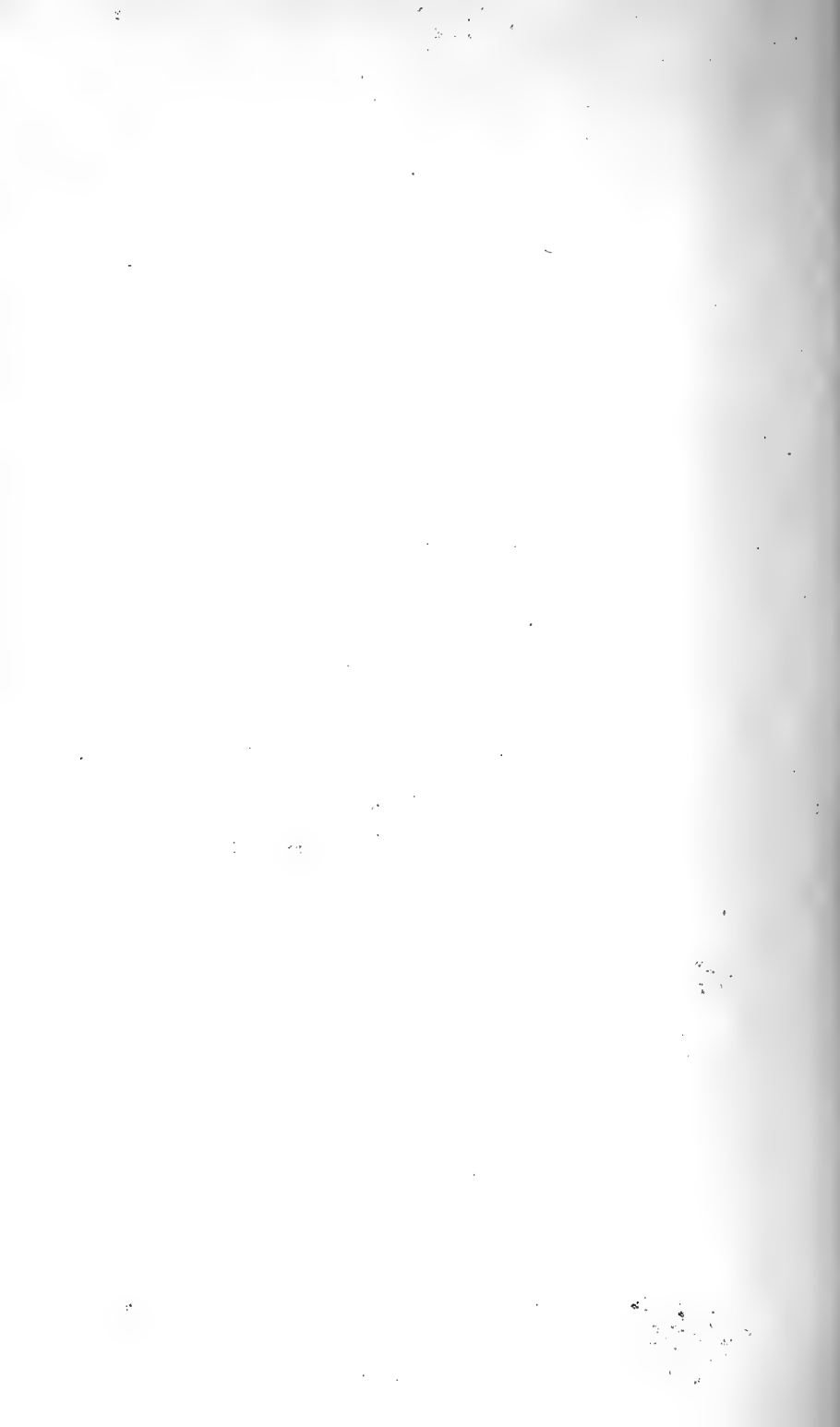
GOMAMELA FAMILY (*Malvaceae*).¹

The plants in this family are usually herbs, shrubs, or trees. The simple leaves are arranged alternately on stems

¹ The cotton plant belonging to this family is treated in the chapter on miscellaneous fibers.



JUTE (*Corchorus capsularis*).



and branches. The latter also bear numerous small modified leaves known as stipules. The flowers occur at the joints or at the ends of branches and may be single or in groups forming panicles. The petals and sepals are 5 in number and regular in shape; pistils and stamens occur in the same flower.

MARBAS.

(*Abutilon indicum*.)

Marbas (Pampanga); pal-lo-pal-lot (Abra).

This species is an annual or perennial plant reaching a height of 2.5 m. The leaves are ashy grey in color, from 5 to 12 cm. long, and have margins entire or serrated. The solitary flowers are yellow and occur on long stalks jointed near the tip. The fruit, 1.5 cm. long and 2 cm. in diameter, consists of 15 to 20 carpels.

Common in waste places throughout the Philippines. The plant is in flower all the year.

LUSUBAN.

(*Bombycidendron vidalianum*.)

Lusuban (Abra, Ilocos Norte).

The plant, known as "lusuban" in Ilocano, is a small tree from 3 to 8 m. high and with a trunk 15 to 25 cm. in diameter. It is often found growing on hillsides. The leaves, oblong in shape and round at the base, are from 10 to 12 cm. long and 4 to 5 cm. broad and borne on short petioles. During the months of January and February the tree may be found in flower or fruit.

The fibers are prepared by retting. The branches of the tree are cut into pieces 1 to 2 m. long and kept in water for about two weeks. The inner bark can then be made ready for use by scraping and washing the fibers. In Abra the fiber is used to a small extent for hat braids. In the latter province, as well as in Ilocos Norte, the fibers from the bark are frequently employed for cordage.

MAPOLA.

(*Hibiscus mutabilis*.)

Mapola (Batangas).

The flowers of this species, borne on long stalks jointed near the top, are white or pink on first opening in the morn-

ing, but change to a deep red before night. The plant grows to the height of a small tree. The leaves are large, heartshaped, toothed, and borne on long petioles. The fruit is a round capsule, somewhat flattened and hairy.

MALABAGO.

(*Hibiscus tiliaceus*.)

Malabago (Capiz, Iloilo, Pangasinan, Sorsogon); balibago (Bulacan, Tarlac); dangliw (Bulacan); malobago (Albay, Sorsogon); mapola (Batangas).

Malabago is a tree widely distributed and well known in the Philippines. It bears large, round, leathery leaves marked generally with seven prominent veins radiating from the apex of the heart-shaped base. The lower surface of the leaves is light grey in color and soft and hairy to the touch. The modified leaves (stipules) are prominent. The large bell-shaped flowers at the end of branches have a crimson center. The tube, bearing stamens, is about 4 cm. long. The fibers are tough and make a fairly strong rope.

BAKEMBAKES.

(*Malachra capitata*.)

Bakembakes (Abra, Ilocos Sur, Union); bulbulin (Pampanga); bulubuluhan, buluhan (Cavite); labug-labug (Iloilo, Occidental Negros); sipit-ulang (Bulacan).

This coarse, hairy, annual herb grows to a height of 2 m. and bears leaves that are somewhat heart-shaped at the base, from 5 to 15 cm. in diameter, and finely toothed along the margins. Flowers are yellow and crowded together among small modified leaves (bracts).

The species is found in waste places throughout the Philippines and is in flower from September to February.

TACLING-BACA.

(*Sida acuta*.)

Tacling-baca (Pangasinan); attay-nab-baca (Iban. in Isabela); calisoalisan, tacquinvaca, ualis-ualisan (Tarlac); herbaka (Ilocos Sur); maratak-kimbaca (Il. in Tarlac); tak-kimbaca (Il. in Abra, Isabela, Ilocos Norte); uualisin (Bulacan); walisualisan (Nueva Ecija).

This shrub may be 2 m. high or higher. Its leaves are 5 to 8 cm. long, narrow, toothed, and supported on short petioles. Along the stems are also found many small modified leaves (stipules), which are 2 or 3 times larger than the petiole. The flowers are yellow; the fruit is very small. The fiber, obtained in the usual way by retting, is light, yellowish-white in color, soft, and glistening.

MARAKAPAS.

(*Thespesia lampas*.)

Marakapas (Amburayan); amagong (Nueva Ecija); macacapas (Zambales); maratamong (Abra).

This shrub, from 2 to 3 m. high, has fine, large, yellow, bell-shaped flowers with a deep purple center. These flowers occur in groups of three on flower stalks (peduncles). The leaves are broad at the base, from 10 to 20 cm. long, and may be three-lobed or entire. The plant may be found in flower from October to January in dry, open places.

KOLLOKOLLOT.

(*Urena* spp., *U. lobata*, *U. lobata* var. *sinuata*.)

Kollokollot (Amburayan, Ilocos Sur, Il. in Tarlac, Nueva Vizcaya); afulut (Gad. in Nueva Vizcaya); kollolot (Abra); kuluk (Iban. in Isabela); kullu-kulluk (Il. in Isabela); puot sinuang (Isi. in Nueva Vizcaya).

The shape of the leaves is the main difference existing between the species and its variety. In the species the leaves are variously angled or lobed, the lobes not extending beyond the middle of the leaf; in its variety the leaf is more deeply lobed. The flowers are pink and usually solitary. The small, round fruit is covered with barbed spines.

The plant is very common throughout the Philippines and may be found in flower all the year. It may be considered a substitute for jute.

THE CACAO FAMILY (*Sterculiaceae*).

The species included in this family have few characteristics in common. They may be shrubs, herbs, or trees. The leaves may be simple or digitately compound, lobed or

not lobed. The flowers are grouped together to form inflorescences which vary greatly in appearance and which may or may not occur on the tips of branches. The fruit may be dry or fleshy and may or may not break open.

In all species, however, the leaves are arranged alternately and modified leaves (stipules) are also present. The sepals of the flowers are always 5 in number and more or less united. The petals are either 5 in number or entirely wanting.

ANABO.

(*Abroma augusta*.)

Anabo (Abra, Batangas, Capiz, Mindoro, Nueva Ecija, Occidental Negros, Pampanga, T.); ambong (T.); anafu (Gad. in Nueva Vizcaya); anabong, labon, nabo (Vis.) (Bohol, Oriental Negros); annabo (Ilocos Norte, Ilocos Sur, Tarlac); bago (Sorsogon); bodobodo (Ilocos Norte); devil's cotton (E.); nabu (Bohol, Cagayan); pacalcal (Pampanga).

This shrub is about 3 m. high or higher and grows wild in valleys and on hillsides throughout the Philippines. On the bark of the stem are many small spines and, when young, also hairs. Fine, sharp, prickly hairs occur also on the leaves and petioles. The lower surface of the leaf is lighter in color than the upper and covered with fine hairs. These adhere like prickles to the skin when the surface is rubbed.

The fruit is a fair-sized capsule open on top, having five hornlike extensions on the outer free surface; five very much smaller projections mark the attachment of the seeds on the inner. In the mature capsule, on the inside near the seeds, are bristlelike hairs and on the outside the same kind of hairs occur as on the leaves.

PREPARATION.

It is possible to separate the bast fibers at once from the bark by hard pounding. Generally, however, the outside part of the shrub is put in water for a period of three to five days. The bast fibers may then be separated with comparative ease from the bark, washed, and dried in the sun.

USES.

The rope made from this bast is flexible, strong, and is of good appearance. As anabo is a very hardy shrub, a

quick grower, so plentiful in some localities as to be considered a "weed," there is no reason why it should not become a more active factor in the rope market.

TONGTONKING.

(*Helicteres hirsuta.*)

Tongtonking (Amburayan); kakaag (Abra).

This shrub is readily recognized by its shaggy, beaked capsule, cylindrical in shape, and from 3 to 5 cm. in length. One-half of the base of the leaf is round while the other is not. The leaves are rarely longer than 15 cm., hairy on the upper surface, soft and downy on the lower, and borne on petioles about 2 to 3 cm. long. The margins are unequally serrated. The species occurs throughout the Philippines.

TANAG.

(*Kleinhofia hospita.*)

Tanag (T., Vis.) (Albay, Batangas, Bulacan, Capiz, Iloilo, Nueva Ecija, Sorsogon, Tarlac); bafe ñga bunsung (Gad. in Nueva Vizcaya); biknong (Zambal. in Zambales); bitnong (Abra, Camarines, Ilocos Norte, Il. in Nueva Vizcaya, Tarlac); hamitanago (Vis.); panampat, pampar (Pampanga).

This small tree is very common throughout the Philippines, is well known, and is often used when rope is wanted for domestic purposes.

The leaves of the tree are usually heart-shaped, broad, and from 10 to 20 cm. long. From 5 to 7 veins radiate from the dent of the heart. The flowers of the panicles are pink, very small, and with sepals longer than petals. The capsules are about 2 cm. long.

APPENDIX A.

A SUGGESTIVE LIST OF ARTICLES AND THE PHILIPPINE INDUSTRIAL FIBERS THAT CAN BE USED IN THEIR MANUFACTURE.

Alparagatas:

Toe: Foreign materials. (*See* Bureau of Education Circular No. 99, s. 1912.)

Sole: Abaca, maguey.

Aprons: Banana sinamay.

Bags. (*See* Hand bags.)

Banks: Coconut shell.

Baskets:

Coiled—

Foundation—

Single: Amlong, rattan.

Multiple: Balangot, buri raffia, tayoc-tayoc, tikug.

Weaver: Abaca cord, abaca fiber, banana fiber, buri raffia, kilog, lupis, maguey, nito, rattan.

Hexagonal: Buri strips, karagumoy, pandan.

Lattice knot weave—

Foundation: Bamboo, rattan.

Weaver: Buri strips, pandan.

Midrib: Buri, coconut, nipa.

Polangui and Zambales type—

Spokes: Bamboo, banban, buri midrib, rattan, sugar palm, tipon-tipon.

Weavers: Amlong, banban, buntal, buri midrib, irao, kalot-kagot, kilog, lupis, nito, pamago, sugar palm, tipon-tipon.

Rims and handles: Rattan.

Binders and decorative materials for rims and handles:
Amlong, buri midrib, buntal, irao, kalot-kagot, kilog, nito, lupis, rattan.

Rice baskets: Bamboo.

Telescope: Bamboo, buri strips, karagumoy, pandan of Majayjay, rattan.

Bayones: Buri strips, lupis, pandan.

Belts: Abaca, kilog, nito, rattan.

Blankets. (*See* Textiles.)

Book bags. (*See* Hand bags.)

Bowls: Coconut shell.

Braids: Abaca, balangot of Batangas, bamboo, buri strips, lupis, rice straw.

Brooms:

Sweeping: Buri midrib, buntal, coconut midrib, nipa midrib, rice straw, sugar-palm midrib, tambó, tiger grass.

Whisk: Abaca, rice straw, vetiver.

Buttons: Coconut shell.

Brushes:

Bench: Sugar-palm fiber.

Hair: Sugar-palm fiber.

Horse: Sugar-palm fiber.

Canes. (See Swagger sticks.)

Caps, baby: Buri raffia.

Card cases. (See Tobacco cases.)

Chairs:

Foundation: Bamboo, rattan, wood.

Seats and binders: Abaca, lupis, nito, rattan.

Clothes. (See Textiles.)

Coat and hat trees: Bamboo, rattan.

Cuffs: Buri raffia.

Cups: Coconut shell.

Curtains. (See Portieres.)

Cushions: Bamboo, buri raffia, pinolpog, sabutan, tikug.

Dippers: Coconut shell.

Doilies: Abaca, buri raffia, pandan, tikug.

Dolls: Kapok stuffing and dressed in Filipino costume made of native cloths.

Doll's furniture: Abaca wound on rattan or air roots.

Dress, Igorot. (See Textiles.)

Embroidery (baby caps, baby dresses, bags, card cases, collars, cuffs, doilies, handkerchiefs, jabots, luncheon sets, neckwear, panels, pin cushions, table runners, waists): Pinolpog, piña, buri raffia, sinamay. (For foreign materials, see Bureau of Education Circular No. 99, s. 1912.)

Fans:

Blades: Bamboo splints, bamboo sheath, buri strips, pandan, vetiver.

Handles: Bamboo, bamboo root, rattan, wood.

Binder for handles: Irao, nito, buri strips, buri raffia.

Flower stands: Bamboo, nito.

Footstools:

Foundation: Bamboo, rattan, wood.

Seats and binders: Abaca, bamboo, lupis, nito, rattan.

Gee strings. (See Textiles.)

Guitars: Coconut shell.

Hampers: Rattan, tipon-tipon, banban, sugar palm, bamboo, amlong, kilog.

Hand bags: Abaca, abaca braid, amlong, balangot, banban, buri mid-rib, buri raffia, buri strips, lupis, pandan, pinolpog, rattan, tayoc-tayoc, tikug.

Handkerchiefs. (*See Textiles.*)

Hats: Abaca braid, abaca sinamay, bamboo, buntal, buri strips, Calasiao strips, karagumoy, lupis, nito, pandan, pandan of Majayjay, pandan raffia, rattan, sabutan, tayoc-tayoc, tikug, vegetable sponge, vetiver.

Hatracks: Bamboo, rattan.

Lace (bobbin, renaissance, Teneriffe, Venetian) for bags, collars, doilies, edgings, insertions: Abaca, abaca braid. (For foreign materials, see Bureau of Education Circular No. 119, s. 1913.)

Lamp shades: Abaca, amlong, banban, bamboo, irao, kilog, nito.

Mats: Banana sheath, bamboo, buri strips, karagumoy, lupis, pandan, pandan of Majayjay, sabutan, tikug.

Napkin rings:

Foundation: Bamboo stem cut crosswise.

Binder: Bamboo splints, buntal, buri strips, nito.

Macramé: Buri raffia.

Note books:

Leaves: The inner sheath of the bamboo.

Cover: Bamboo splints.

Picture frames: Buri raffia cloth decorated with abaca braid, buri strips, moras straw, pandan of Majayjay, sabutan, pandan, sugar cane.

Pillows. (*See Cushions.*)

Pitchers: Bamboo joints.

Portieres: Abaca, nito.

Powder boxes: Coconut shell.

Purses. (*See Tobacco cases.*)

Ropes: Abaca, bast fibers, balangot of Batangas, bowstring hemp, buntal, buri raffia, buri strips, cobboot, coir fiber, maguey, rice straw, sugar-palm fiber.

Rugs: Buri raffia, coir fiber, sugar-palm fiber.

Savings banks: Coconut shell.

School bags. (*See Hand bags.*)

Screens:

Folding—

Frame: Bamboo, rattan, wood.

Sides: Bamboo, buri raffia.

Window: Bamboo, banban, cat-tail, palm splints.

Slippers:

Toe: Abaca, areca sheath, balangot, buri raffia cloth, cat-tail, cobboot, lupis, maguey, pandan of Majayjay, rice straw, split pandan, tayoc-tayoc, tiker, tikug, vegetable sponge.

Lower sole: Abaca, balangot, cat-tail, cobboot, lupis, maguey, pandan of Majayjay, tayoc-tayoc, tiker, tikug.

Slipper holders: Buri strips, pandan, tikug.

Spoons: Coconut shell.

Swagger sticks: Rattan wound with abaca, buntal, Calasiao splints, irao, kilog, lupis, nito.

Tables: Bamboo, rattan, wood.

Tatting:

Toes of slippers: Abaca.

Textiles: Abaca, bowstring hemp, buri raffia, cotton, maguey, pineapple fiber.

Tobacco cases: Bamboo, buri strips, Calasiao splints, nito, sabutan, tikug.

Valises. (*See* Hand bags.)

Wall pockets: Bamboo, buri strips, pandan of Majayjay, sabutan.

Washstands: Bamboo, rattan.

Whips. (*See* Swagger sticks.)

APPENDIX B.

*Plants reported by teachers to the General Office, Bureau of Education,
in response to Circular 175, s. 1910. Under each species name
are given the names of only those provinces reporting same.*

Ferns.

Scientific name and province.	Common name.	Local name.
<i>Lygodium circinnatum:</i>		
Albay	Nito	Agsam.
Antique	do	Nito.
Bohol	do	Do.
Cagayan	do	Do.
Camarines	do	Do.
Capiz	do	Do.
Cavite	do	Do.
Cebu	do	Do.
Ilocos Norte	do	Do.
Ilocos Sur	do	Do.
Iloilo	do	Do.
Isabela	do	Do.
Laguna	do	Do.
Leyte	do	Do.
Occidental Negros	do	Do.
Oriental Negros	do	Do.
Pangasinan	do	Do.
Sorsogon	do	Do.
Surigao-Misamis	do	Do.
Tayabas	do	Do.
Union	do	Do.
Zambales	do	Do.
Moro	do	Nau.
<i>Lygodium flexuosum:</i>		
Bataan	do	(a)
Batangas	do	(a)
Cagayan	do	(a)
Cavite	do	Nito.
Cebu	do	Do.
Iloilo	do	Do.
Isabela	do	Nitu (Ib.), calulung (Iban.), sacitang.
Laguna	do	(Il.).
Nueva Vizcaya	do	(a)
Oriental Negros	do	(a)
Rizal	do	(a)
Samar	do	Nito.
Union	do	(a)
Zambales	do	(u)
Moro	do	(a)
<i>Lygodium japonicum:</i>		
Bataan	do	(a)
Batangas	do	(a)
Bulacan	do	(a)
Cagayan	do	(a)
Ilocos Norte	do	(a)
Isabela	do	Nito (Il.), carecay (Iban.).
Laguna	do	(a)
Leyte	do	(a)
Mindoro	do	(a)
Nueva Ecija	do	(a)
Rizal	do	(a)
Tayabas	do	(a)
Moro	do	(a)

* Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

FERNS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Lygodium semihastatum</i> :		
Albay	Nito	Anton.
Cagayan	do	(a)
Laguna	do	(a)
Mindoro	do	(a)
Occidental Negros	do	(a)
Sorsogon	do	Nito.
Tayabas	do	(a)
<i>Dryopteris pteroides</i> :		
Ilocos Norte	Locdo	(a)
Laguna	do	(a)
Mindoro	do	(a)
Pampanga	do	(a)
Rizal	do	(a)
Samar	do	Locdo.
Moro	do	(a)
<i>Gleichenia linearis</i> :		
Albay	Kilog	(a)
Laguna	do	Kilog.
Mindoro	do	(a)
Mountain	do	(a)
Rizal	do	(a)
Tayabas	do	(a)
Moro	do	(a)
<i>Nephrolepis hirsutula</i> :		
Albay	Alolokdo	Alolokdo.
Ilocos Sur	do	(a)
Laguna	do	(a)
Mindoro	do	Alolokdo.
Occidental Negros	do	(a)
Rizal	do	(a)
Sorsogon	do	Korokalasag.
Tayabas	do	(a)
Moro	do	(a)
<i>Stenochlaena palustris</i> :		
Capiz	Jagnaya	Hagnaya.
Iloilo	do	Do.
Laguna	do	Do.
Leyte	do	(a)
Palawan	do	Agnaya.
Sorsogon	do	Jagnaya.
Surigao-Misamis	do	(a)
Tayabas	do	(a)
Moro	do	(a)

Pandans.

<i>Pandanus copelandii</i> :		
Agusan	Bariu	Baloy, baroy.
Albay	do	Bariu, boreo, boreu, buruiu.
Bohol	do	Baleo, balewe, baliu, balio.
Cagayan	do	(a)
Capiz	do	Baleo, balewe, baliu, balio.*
Laguna	do	Lagutlut.
Mountain	do	(a)
Nueva Ecija	do	(a)
Nueva Vizcaya	do	(a)
Occidental Negros	do	Baleau.
Pangasinan	do	(a)
Samar	do	Bareu.
Surigao-Misamis	do	Baleo, balewe, baliu, balio, baloy, baroy.
Zambales	do	(a)
Moro	do	(a)

* Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

PANDANS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Pandanus dubius</i> :		
Bohol	Taboan	Bacong.
Surigao-Misamis	do	Taboan.
Moro	do	(a)
<i>Pandanus luzonensis</i> :		
Bulacan	Alasas	Pandan de China.
Rizal	do	Alasas, dasa.
Zambales	do	Alasas.
<i>Pandanus radicans</i> :		
Albay	Oyaño	Oyaño.
Bohol	do	Wango.
Leyte	do	Olango.
Sorsogon	do	Uyango.
Surigao-Misamis	do	Owango.
<i>Pandanus sabotan</i> :		
Laguna	Sabutan	Sabutan.
Rizal	do	Do.
Tayabas	do	Do.
<i>Pandanus simplex</i> :		
Albay	Karagumoy	Karagumoy.
Camarines	do	Do.
Cebu	do	Do.
Leyte	do	Do.
Sorsogon	do	Do.
Tayabas	do	Do.
<i>Pandanus tectorius</i> :		
Antique	Common pandan	Pandan.
Batangas	do	Do.
Bulacan	do	Do.
Cebu	do	Do.
Ilocos Sur	do	Pangdan.
Iloilo	do	Pandan.
Leyte	do	Do.
Mindoro	do	Do.
Oriental Negros	do	Do.
Pampanga	do	Do.
Rizal	do	Do.
Surigao-Misamis	do	Do.
Tarlac	do	Do.
Tayabas	do	Do.
Zambales	do	Panglan.
Moro	do	Pandan.
<i>Pandanus utilisissimus</i> :		
Laguna	Pandan of Majayjay	Pandan, pandan totoo, kalaguimay.
Nueva Vizcaya	do	(a)
Tayabas	do	(a)

Palms.

<i>Areca catechu</i> :		
Bataan	Areca nut palm	Bunga.
Batangas	do	Do.
Bulacan	do	Do.
Cagayan	do	Bua.
Camarines	do	Banga.
Cavite	do	Bunga.
Ilocos Norte	do	Boa.
Ilocos Sur	do	Do.
Laguna	do	Bunga.
Pampanga	do	Luyos.
Rizal	do	Bunga.
Tayabas	do	Do.
<i>Arenga mindorensis</i> :		
Albay	Dumayaca palm	Tipon-tipon, bilis.
Bataan	do	(a)

^a Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

PALMS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Arenga mindorensis</i> —Cont'd.		
Batangas.....	Dumayaca palm	Dumayaca.
Camarines.....	do	Abigui, romaka.
Laguna.....	do	Gumayaka.
Mindoro.....	do	(a)
Sorsogon.....	do	Belis.
Tayabas.....	do	Dumayaca, dayumaka.
<i>Arenga saccharifera</i> :		
Albay.....	Sugar palm.....	Hidiok.
Antique.....	do	Hidiok, igok.
Bohol.....	do	Batbat, ebiok.
Capiz.....	do	Hibiok, hidiok, palma criste, habiok.
Cavite.....	do	Irok, kaong.
Iloilo.....	do	Hibiok.
Laguna.....	do	Kaong.
Mindoro.....	do	Irok.
Occidental Negros.....	do	Hibiok.
Oriental Negros.....	do	Bagotbat, idiok.
Surigao-Misamis.....	do	Onao.
Tayabas.....	do	Irok.
Zambales.....	do	Do.
<i>Caryota cumingii</i> :		
Albay.....	Pugahan.....	Hagol.
Sorsogon.....	do	Pugahan, hagol.
Tayabas.....	do	Pugahan.
<i>Cocos nucifera</i> :		
Bataan.....	Coconut palm	Niog.
Batangas.....	do	Do.
Bulacan.....	do	Do.
Cavite.....	do	Do.
Cebu.....	do	Lubi.
Ilocos Norte.....	do	Niog.
Ilocos Sur.....	do	Do.
Laguna.....	do	Do.
Rizal.....	do	Do.
Tayabas.....	do	Do.
<i>Corypha elata</i> :		
Albay.....	Buri palm	Buri, silad.
Antique.....	do	Buri.
Batangas.....	do	Do.
Bohol.....	do	Buli.
Capiz.....	do	Buri.
Cebu.....	do	Buri, buli.
Ilocos Norte.....	do	Buri, silag.
Iloilo.....	do	Buri.
Laguna.....	do	Buli.
Leyte.....	do	Buri.
Nueva Ecija.....	do	Buri, piet.
Nueva Vizcaya.....	do	Taktak, bagatay.
Occidental Negros.....	do	Buri.
Oriental Negros.....	do	Buli.
Pampanga.....	do	Ebus.
Pangasinan.....	do	Piet, silag.
Rizal.....	do	Buri.
Sorsogon.....	do	Do.
Tarlac.....	do	Ebus, silag.
Tayabas.....	do	Buri.
Union.....	do	Silag.
Moro.....	do	Buri.
<i>Heterospathe elata</i> :		
Albay.....	Saguise palm	Saguisi.
Bohol.....	do	Sagise, seguise.
Cagayan.....	do	(a)
Camarines.....	do	(a)
Cebu.....	do	(a)
Laguna.....	do	(a)

^a Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

PALMS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Heterospathe elata</i> —Cont'd.		
Mindoro	Saguise palm	(a)
Moro	do	(a)
<i>Livistona rotundifolia</i> :		
Albay	Palma brava	Anahao.
Antique	do	Bahi.
Bohol	do	Do.
Cagayan	do	Anan, ballang.
Capiz	do	Bahi.
Cebu	do	Do.
Ilocos Norte	do	Anaáo, labig.
Ilocos Sur	do	Do.
Iloilo	do	Bahi.
Isabela	do	Anao.
Laguna	do	Anahao.
Leyte	do	Bahi.
Occidental Negros	do	Do.
Oriental Negros	do	Do.
Pangasinan	do	Palma brava, abiang.
Samar	do	Bagsang, bahi.
Tayabas	do	Anahao.
<i>Nipa fruticans</i> :		
Antique	Nipa palm	Nipa.
Bataan	do	Sasá, lása.
Batangas	do	Do.
Bohol	do	Sása.
Bulacan	do	Sasá, lása.
Cagayan	do	Tatá.
Cavite	do	Sasá, lása.
Cebu	do	Nipa.
Laguna	do	Sasá, lása.
Mindoro	do	Sasá.
Pampanga	do	Sasá, nipa.
Rizal	do	Sasá, lása.
Tayabas	do	Do.
Zambales	do	Sága.

^a Reported by Bureau of Science.

Rattans.

<i>Calamus mollis</i> :		
Albay	Uay	Hanapas.
Bohol	do	Uay.
Bulacan	do	Do.
Cavite	do	Uay, yantoc.
Cebu	do	Uay.
Isabela	do	Bari.
Leyte	do	Tagaloa.
Oriental Negros	do	Uay, tagocan.
Pangasinan	do	Uay, oey.
Tarlac	do	Barit (Il.).
Union	do	Barit.
Zambales	do	Babuyan, barit.
<i>Daemonorops gaudichaudii</i> :		
Albay	Samulig	Labnig.
Camarines	do	Gatasan.
Capiz	do	Do.
Sorsogon	do	Samulig, lacaon, ouay babae, ouay na binabae, palasan, parasan, tikol, gatasan, labnig.
Tarlac	do	Bogbog.
Tayabas	do	Labnig.

Plants reported by teachers, etc.—Continued.

Grasses.

Scientific name and province.	Common name.	Local name.
<i>Andropogon</i> (<i>A. zizanioides</i> , <i>A. squarrosus</i> , <i>A. muricatus</i>):		
Albay	Vetiver	Mora.
Antique	do	Do.
Bohol	do	Amora.
Camarines	do	Moras.
Capiz	do	Rimodas, tres moras.
Cebu	do	Amora, mora.
Ilocos Sur	do	Anis de moro.
Iloilo	do	Gueron, guiron, mora.
Occidental Negros	do	Mora.
Pampanga	do	Anias, anias de moras, ilib.
Sorsogon	do	Moro.
<i>Andropogon aciculatus</i> :		
Capiz	Amores secos	Amores secos.
Cebu	do	Do.
Iloilo	do	Amores secos, bariri, dalokot.
Occidental Negros	do	Amores secos.
Pampanga	do	Do.
<i>Andropogon intermedius</i> :		
Cebu	Beling	Beling, biling.
<i>Andropogon halepensis</i>	Batad-batadan	
<i>Coix lachryma-jobi</i> :		
Albay	Job's-tears	Adlay, bintikay, burobayoco, pintaka, tigbikay.
Bataan	do	Tigbi.
Batangas	do	Do.
Bohol	do	Katigbi.
Bulacan	do	Tigbi.
Camarines	do	Coldasan.
Cavite	do	Tigbi.
Cebu	do	Dumao, panas, pintaka.
Ilocos Norte	do	Abukay (Il.).
Ilocos Sur	do	Do.
Laguna	do	Tigbi.
Occidental Negros	do	Alimodjas, poyas.
Pampanga	do	Balantakan.
Rizal	do	Tigbi.
Sorsogon	do	Adlay, bintikay, burobayoco, pintaka, tigbikay.
Surigao-Misamis	do	Aglay.
Tayabas	do	Tigbi.
<i>Imperata cylindrica</i> :		
Antique	Cogon	Cogon.
Camarines	do	Do.
Cebu	do	Do.
Ilocos Norte	do	Panao.
Ilocos Sur	do	Do.
Iloilo	do	Cogon.
Isabela	do	Mimi, panac.
Nueva Vizcaya	do	Cun, guyun, panao.
Pampanga	do	Cogon.
<i>Ischaemum angustifolium</i> :		
Cagayan	Cobboot	Cobboot.
Ilocos Norte	do	Do.
Mountain	do	Puenig.
Nueva Vizcaya	do	Cobboot.
Pangasinan	do	Do.
<i>Miscanthus sinensis</i> :		
Albay	Bigao	Bigao.
Sorsogon	do	Bigao, bigaho, gaho, guisa.
<i>Oryza sativa</i>	Rice	
<i>Phragmites vulgaris</i> :		
Albay	Tambo	Tambo.
Antique	do	Tabunac.
Bataan	do	Tambo.
Bohol	do	Bugang.
Camarines	do	Lupi.
Cebu	do	Tangbo.
Ilocos Norte	do	Tanobong (Il.).

Plants reported by teachers, etc.—Continued.

GRASSES—Continued.

Scientific name and province.	Common name.	Local name.
<i>Phragmites vulgaris</i> —Cont'd.		
Ilocos Sur	Tambo	Tanobong (Il.).
Iloilo	do	Tabunac.
Isabela	do	Taguisi, tantanubong.
Leyte	do	Tambo.
Oriental Negros	do	Do.
Rizal	do	Do.
Tayabas	do	Do.
<i>Saccharum officinarum</i>	Sugar cane	
<i>Saccharum spontaneum</i> :		
Albay	Talahib	Talahib.
Antique	do	Tigbao.
Bohol	do	Bugang.
Iloilo	do	Tigbao.
Isabela	do	Talahib, sikal.
Occidental Negros	do	Tigbao.
Sorsogon	do	Talahib.
Tayabas	do	Do.
Zambales	do	Talahib, sidda.
<i>Sporobolus elongatus</i> :		
Iloilo	Bacuit	Bacuit, banquit.
<i>Thysanolaena maxima</i> :		
Bataan	Tiger grass	Lasa.
Bulacan	do	(a)
Ilocos Norte	do	Buibui (Il.).
Ilocos Sur	do	Do.
Mindoro	do	(a)
Mountain	do	Tagadeu.
Occidental Negros	do	(a)
Pampanga	do	Bugubui (Negrito).
Rizal	do	(a)
<i>Apluda mutica</i> :		
Pampanga	Calamutian	Calamutian.
Samar	do	Maycauyan.
<i>Eleusine indica</i> :		
Occidental Negros	Palagtiqui	Palagtiqui.
Pampanga	do	Sabun̄g-sabun̄gan.
Tarlac	do	Gagabutan.
<i>Ophiurus corymbosus</i> :		
Camarines	Sigburon	Sigburon.
<i>Eragrostis tenella</i> :		
Pampanga	Sale ayup	Sale ayup.
<i>Eragrostis viscosa</i> :		
Cavite	Pugad maya	Pugad maya.

^a Reported by Bureau of Science.

Bamboo.

<i>Bambusa blumeana</i> :		
Albay	Spiny bamboo	Duguian, kabugaoan, marurugui, ruguian.
Antique	do	Kawayan.
Bataan	do	Kawayan, kawayan totoo.
Batangas	do	Kawayan totoo.
Bohol	do	Kawayan.
Bulacan	do	Kawayan, kawayan totoo.
Cagayan	do	Pasingan.
Capiz	do	Aono-o.
Cavite	do	Kawayan, kawayan tot oo.
Cebu	do	Kawayan.
Iloilo	do	Kawayan guid, paua.
Laguna	do	Kawayan totoo, kawayan matinic.
Mindoro	do	Kawayan.
Nueva Vizcaya	do	Bayug.
Occidental Negros	do	Kawayan, kawayan n̄ga bulilao.
Pampanga	do	Baguin, kawayan.
Rizal	do	Kawayan.

Plants reported by teachers, etc.—Continued.

BAMBOO—Continued.

Scientific name and province.	Common name.	Local name.
<i>Bambusa blumeana</i> —Cont'd.		
Sorsogon	Spiny bamboo	Duguian, kabugaoan, marurugui, ruguian, kawayan.
Surigao-Misamis	do	Batakan, kawayan.
Tarlac	do	Kawayan.
Tayabas	do	Kawayan matinic.
Union	do	Kawayan seitan.
Zambales	do	Bayog.
Moro	do	Kawayan.
<i>Bambusa glaucescens</i>	Dwarfed bamboo	
<i>Bambusa vulgaris</i> :		
Albay	Kawayan kiling	Butong, kaboloan.
Antique	do	Burirao.
Bohol	do	Lunas.
Bulacan	do	Kawayan kiling.
Capiz	do	Butong.
Cavite	do	Kawayan kiling, taywanac.
Cebu	do	Lunas, sinambang, kawayan sa China.
Iloilo	do	Bolinao.
Laguna	do	Kawayan hobero.
Leyte	do	Lunas.
Nueva Ecija	do	Kawayan kiling, kawayan bayuguin.
Nueva Vizcaya	do	Kawayan kiling.
Occidental Negros	do	Kawayan nga dalusa.
Tarlac	do	Kawayan kiling.
Union	do	Do.
Zambales	do	Do.
<i>Bambusa vulgaris</i> var. <i>striata</i> .	Yellow bamboo	
<i>Dendrocalamus latiflorus</i> :		
Albay	Botong	Botong, kaboloan.
Camarines	do	Botong, bolongsina.
Cebu	do	Botong, butun.
Sorsogon	do	Kaboloan, patong.
Surigao-Misamis	do	Patong.
<i>Dinochloa scandens</i> :		
Cebu	Zigzag bamboo	Balukawi.
Mindoro	do	Balukawi, timak.
Moro	do	Bukao.
<i>Gigantochloa scribneriana</i> :		
Bohol	Bolo	Botong.
Bulacan	do	Kawayan de China.
Capiz	do	Bolo, boco, botong.
<i>Schizostachyum acutiflorum</i> :		
Albay	Bikal	Hindi, indi, inri.
Bataan	do	Guimac.
Bohol	do	Bongbong.
Cebu	do	Do.
Ilocos Sur	do	Bikal.
Iloilo	do	Baliaro, balicao.
Pampanga	do	Bikal, lilit (Negrito).
Pangasinan	do	Bikal.
Sorsogon	do	Hindi, indi, inri.
<i>Schizostachyum dielsianum</i> :		
Batangas	Bikal babi	(a)
Bohol	do	Lo-ob.
Cagayan	do	Bikal.
Cavite	do	Usio, usiw.
Laguna	do	Do.
Pampanga	do	Bikal babi, bikal machui (Negrito).
Tarlac	do	(a)
Union	do	Bikal.
Zambales	do	Bikal baboy.
<i>Schizostachyum fenixii</i> :		
Ilocos Sur	Puser	Puser.
<i>Schizostachyum hallieri</i> :		
Bataan	Bagakay	Anos.
Cavite	do	Do.

^a Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

BAMBOO—Continued.

Scientific name and province.	Common name.	Local name.
<i>Schizostachyum hallieri</i> —Ctd.		
Cebu	Bagakay	Bagakay.
Laguna	do	Anos.
Mindoro	do	Do.
Union	do	Bolo.
<i>Schizostachyum hirtiflorum</i> :		
Iloilo	Bagakan	Bulu.
Nueva Vizcaya	do	Do.
Palawan	do	Bulu, bagakan.
Zambales	do	Bulu.
<i>Schizostachyum mucronatum</i> :		
Albay	Buhó	Bagakay, oras.
Bohol	do	Bagakay.
Camarines	do	Buhó.
Capiz	do	Bagakay.
Cavite	do	Buhó.
Iloilo	do	Bagakay.
Laguna	do	Kawayan sunsong.
Leyte	do	Bagakay.
Sorsogon	do	Do.

Sedges and similar plants.

<i>Cyperus malaccensis</i> :		
Bataan	Balangot	Balangot.
Bulacan	do	Do.
Camarines	do	Do.
Capiz	do	Baga-as.
Cavite	do	Balangot.
Cebu	do	Do.
Leyte	do	Do.
Mindoro	do	Do.
Pampanga	do	Do.
Rizal	do	Do.
<i>Cyperus radiatus</i> :		
Albay	Alinang	Alinang.
Bulacan	do	Balabalangutan.
Cagayan	do	Upopi.
Capiz	do	Obod-obod.
Cebu	do	Alinang.
Leyte	do	Do.
Oriental Negros	do	Malapandan dagko.
Sorsogon	do	Alinang.
Tayabas	do	Obod-obod.
<i>Cyperus tegetiformis</i>	Chinese matting sedge	
<i>Fimbristylis diphylla</i> :		
Cagayan	Tayoc-tayoc	(a)
Capiz	do	Tayoc-tayoc.
Iloilo	do	Do.
Laguna	do	(a)
Mountain	do	Pauai.
Nueva Vizcaya	do	(a)
Occidental Negros	do	Tayoc-tayoc.
Rizal	do	(a)
Surigao-Misamis	do	(a)
Zambales	do	Tayoc-tayoc, tabtabin.
<i>Fimbristylis miliacea</i> :		
Samar	Worthless tikug	
<i>Fimbristylis utilis</i> :		
Agusan	Tikug	Anahiwan.
Bohol	do	Tikug.
Cebu	do	Do.
Iloilo	do	Tayoc-tayoc.
Laguna	do	(a)
Leyte	do	Tikug.
Pampanga	do	Muta.

* Reported by Bureau of Science.

Plants reported by teachers, etc.—Continued.

SEDGES AND SIMILAR PLANTS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Fimbristylis utilis</i> —Cont'd.		
Surigao-Misamis	Tikug	Anahiwan.
Tayabas	do	(a)
Moro	do	Anahiwan, sud-sud.
<i>Juncus effusus</i>	Matting rush	
<i>Rynchospora aurea</i> :		
Albay	Agas	Agas, bariu-bariu, raguidiu.
Camarines	do	Raguidio, raguio, rakeydo.
Cebu	do	Agas.
Laguna	do	Tikiu.
Leyte	do	Agas.
Sorsogon	do	Agas, bariu-bariu, raguidiu, piso-piso.
<i>Scirpus erectus</i> :		
Occidental Negros	Ticog	Ticog, tayoc-tayoc.
<i>Scirpus grossus</i> :		
Albay	Tiquio	Agas.
Camarines	do	Balangot.
Capiz	do	Baguibagui, balangot.
Occidental Negros	do	Baga-as.
Rizal	do	Tiquio.
<i>Scirpus lacustris</i> :		
Cagayan	Tiker	Tiker.
Ilocos Norte	do	Do.
Ilocos Sur	do	Do.
<i>Scirpus mucronatus</i> :		
Leyte	Biluan	Biluan.
<i>Typha angustifolia</i> :		
Batangas	Cat-tail	Balangot.
Bohol	do	Lampacanay.
Iloilo	do	(a)
Leyte	do	Balangot.
Mindoro	do	(a)
Oriental Negros	do	Tubol-tubol.
Pangasinan	do	Caidqued.

* Reported by Bureau of Science.

Vines.

<i>Pothos longifolius</i> :		
Sorsogon	Amlong	Hipan, oroola.
<i>Pothos ovatifolius</i> :		
Albay	Amlong	Kalot-kagot.
Camarines	do	Do.
Samar	do	Do.
Sorsogon	do	Do.
Tayabas	do	Kalipkip.
<i>Pothos philippinensis</i> :		
Albay	Amlong	Baladauan, ooolaypan.
Bataan	do	Do.
Bulacan	do	Do.
<i>Pothos rumphii</i> :		
Albay	Amlong	Amlong.
Laguna	do	Do.
Mindoro	do	Do.
Oriental Negros	do	Do.
<i>Raphidophora perkinsiae</i> :		
Mountain	Amlong	Amlong.
Tayabas	do	Do.
<i>Raphidophora merrillii</i> :		
Albay	Black amlong	Amlong, bacog.
Batangas	do	Lukmoy.
Bohol	do	Amlong, takoling.
Cavite	do	Tibatib.
Cebu	do	Takoling.
Isabela	do	Garusiba.
Laguna	do	Tibatib.
Nueva Vizcaya	do	Balision, amiling, amuling.

Plants reported by teachers, etc.—Continued.

VINES—Continued.

Scientific name and province.	Common name.	Local name.
<i>Raphidophora merrillii</i> —Ctd.		
Sorsogon	Black amlong	Amlong.
Tarlac	do	Do.
Tayabas	do	Lukmoy.
Zambales	do	Amolong, gayaman kilat, maragaya-man.
<i>Epipremnum elmerianum</i> :		
Leyte	White amlong	
Mindoro	do	Lukmoy.
<i>Raphidophora copelandii</i> :		
Mindoro	Brown amlong	Do.
Mountain	do	
Moro	do	
<i>Entada scandens</i> :		
Antique	Gogo	Balogo, balones, bayogo, gohong bacay.
Bataan	do	Bayogo.
Batangas	do	Do.
Bohol	do	Balogo, balones, bayogo, gohong bacay.
Bulacan	do	Gogo or gugo, bayogo.
Capiz	do	Balogo, balones, bayogo, gohong bacay.
Cavite	do	Bayogo.
Cebu	do	Balogo, balones, bayogo, gohong bacay.
Ilocos Norte	do	Lipai.
Ilocos Sur	do	Do.
Iloilo	do	Balogo, balones, bayogo, gohong bacay.
Laguna	do	Bayogo.
Leyte	do	Balogo, balones, barugo, bayogo, gohong bacay.
Mindoro	do	Balugo.
Nueva Ecija	do	Bayogo.
Nueva Vizcaya	do	Do.
Occidental Negros	do	Balogo, balones, bayogo, gohong bacay.
Oriental Negros	do	Do.
Pampanga	do	Bayogo, gohong bacay.
Rizal	do	Bayogo.
Samar	do	Balogo, balones, bayogo, gohong bacay.
Tayabas	do	Gogo or gugo, bayogo.
Union	do	Lipai.
<i>Flagellaria indica</i> :		
Albay	Hoag	Hoag.
Antique	do	Do.
Cagayan	do	Caluuauay.
Camarines	do	Hoag.
Capiz	do	Hoag, sagakap.
Cebu	do	Hoag, bulokawi.
Iloilo	do	Hoag.
Isabela	do	Oay ti oac, tewung, kaliwayway.
Laguna	do	Balingway.
Mindoro	do	Balingway, bulokawi.
Nueva Ecija	do	Balingway.
Nueva Vizcaya	do	Auni si gayang, uenag ayang anuad.
Pangasinan	do	Inuad, inual.
Rizal	do	Balingway.
Sorsogon	do	Hoag, hoagoay.
Tayabas	do	Balingway.
Union	do	Annuad.
<i>Luffa cylindrica</i> :		
Antique	Vegetable sponge	Patola.
Bataan	do	Do.
Batangas	do	Do.
Bohol	do	Do.
Bulacan	do	Patola, tabubuc.
Camarines	do	Patola.
Capiz	do	Do.

Plants reported by teachers, etc.—Continued.

VINES—Continued.

Scientific name and province.	Common name.	Local name.
<i>Luffa cylindrica</i> —Cont'd.		
Cavite	Vegetable sponge	Patola.
Ilocos Norte	do	Kabatiti (Il.).
Ilocos Sur	do	Do.
Iloilo	do	Patola.
Laguna	do	Do.
Leyte	do	Do.
Occidental Negros	do	Do.
Oriental Negros	do	Do.
Pampanga	do	Tabongas.
Pangasinan	do	Do.
Rizal	do	Patola.
Samar	do	Do.
Tarlac	do	Tabubuc.
Tayabas	do	Patola.
<i>Percampylus incanus</i> :		
Albay	Pamago	Pamago.
Batangas	do	Silong pugo.
Camarines	do	Pamago.
Laguna	do	(a)
Leyte	do	(a)
Mindoro	do	Tugui-tugui.
Mountain	do	(a)
Palawan	do	(a)
Rizal	do	(a)
Sorsogon	do	Pamago.
Moro	do	(a)

^a Reported by Bureau of Science.

Plants with leaf or petiole fibers of commercial value.

<i>Agave cantala</i>	Maguey	
<i>Ananas sativus</i> :		
Camarines	Piña	Malisa.
Ilocos Norte	do	Pita (Il.).
Ilocos Sur	do	Do.
<i>Musa textilis</i>	Abaca	
<i>Musa paradisiaca</i>	Banana	
<i>Sansevieria zeylanica</i> :		
Antique	Bowstring hemp	Rabo de tigre.
Bohol	do	Tigre.
Ilocos Norte	do	Rabo de leon.
Iloilo	do	Sabila.
Isabela	do	Cakarahay, pacarahay, tigui.
Laguna	do	Tigre.
Nueva Ecija	do	Sinawa.
Nueva Vizcaya	do	Banyat, callot, sigre.
Pampanga	do	Aspeaspe.
Sorsogon	do	Lengua de tigre.
Tayabas	do	Bontot palos.
Union	do	Rabo de leon.

Miscellaneous industrial fibers.

<i>Ceiba pentandra</i> :		
Antique	Kapok	Doldol, kayo.
Bataan	do	Boby, bubuy, bulak, bulaksino.
Batangas	do	Do.
Bohol	do	Doldol, kayo.
Bulacan	do	Balios, kapak, bulak, boby, bubuy, bulaksino.
Capiz	do	Doldol, kayo.
Cavite	do	Boby, bubuy, bulak, bulaksino.

Plants reported by teachers, etc.—Continued.

MISCELLANEOUS INDUSTRIAL FIBERS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Ceiba pentandra</i> —Cont'd.		
Cebu	Kapok	Bulak-dondol, dondol, dogdol, kayo.
Ilocos Norte	do	Capas, kapas-sanglay.
Ilocos Sur	do	Do.
Iloilo	do	Doldol, kayo.
Laguna	do	Boby, bubuy, bulak, bulaksino.
Leyte	do	Doldol, kayo.
Occidental Negros	do	Do.
Oriental Negros	do	Do.
Pampanga	do	Bulak-castila.
Rizal	do	Boby, bubuy, bulak, bulaksino, kapak.
Samar	do	Doldol, kayo.
Tayabas	do	Boby, bubuy, bulak, bulaksino.
<i>Gossypium</i> spp.	Cotton	
<i>Dendrobium crumenatum</i> :		
Albay	Irao	Irao.
Bohol	do	Magimpal, magimpao.
Cagayan	do	Karausi.
Camarines	do	Irao.
Ilocos Norte	do	Karonsi.
Ilocos Sur	do	Caramosi.
Isabela	do	Karulay.
Laguna	do	Sangumay.
Leyte	do	Manano.
Sorsogon	do	Irao.
<i>Donax cannaeformis</i> :		
Albay	Banban	Banban.
Antique	do	Do.
Bataan	do	Barasbarasan.
Batangas	do	Do.
Bohol	do	Banban.
Bulacan	do	Barasbarasan.
Cagayan	do	Banban.
Camarines	do	Bamban.
Capiz	do	Banban.
Cavite	do	Banban, barasbarasan.
Cebu	do	Bamban.
Ilocos Norte	do	Langkuas.
Ilocos Sur	do	Do.
Iloilo	do	Banban.
Laguna	do	Banban, barasbarasan.
Leyte	do	Manban.
Mindoro	do	Banban.
Nueva Vizcaya	do	Aratan, darumaka, mattapal.
Occidental Negros	do	Banban.
Oriental Negros	do	Do.
Palawan	do	Do.
Pampanga	do	Do.
Rizal	do	Barasbarasan.
Sorsogon	do	Banban, bamban.
Tarlac	do	Banban, daromaka.
Tayabas	do	Banban, barasbarasan.
Union	do	Darumaka.
Zambales	do	Do.

Bast fibers.

<i>Corchorus</i> spp.	Jute	
<i>Corchorus acutangulus</i>	do	
<i>Corchorus capsularis</i>	do	
<i>Corchorus olitorius</i>	do	
<i>Columbia serratifolia</i> :		
Bulacan	Anilao	Anilao.
Capiz	do	Do.
Iloilo	do	Do.
Isabela	do	Keddeng, panaguising.
Nueva Ecija	do	Anilao.
Occidental Negros	do	Anilao, sargo.

Plants reported by teachers, etc.—Continued.

BAST FIBERS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Grewia multiflora</i> :		
Albay	Danglin	Taroy.
Bataan	do	Danglin.
Batangas	do	Do.
Bohol	do	Langosig.
Camarines	do	Taroy.
Ilocos Sur	do	Alinao.
Mindoro	do	Siapo.
Mountain	do	Alinao.
Nueva Ecija	do	Danglin.
Nueva Vizcaya	do	Dallag.
Pampanga	do	Aplit, lanut (Negrito), nagling.
Pangasinan	do	Alinao.
Sorsogon	do	Do.
Tayabas	do	Dangli, kalit-kalit.
Union	do	Alinao, al-alinao.
Zambales	do	Alinao.
<i>Grewia negrosensis</i> :		
Batangas	Balitnong	Kanas-kanas.
Capiz	do	Balitnong.
Ilocos Norte	do	Do.
Ilocos Sur	do	Queddeng.
Union	do	Do.
<i>Abutilon indicum</i> :		
Ilocos Sur	Marbas	Pal-lo-pal-lot.
Pampanga	do	Marbas.
<i>Bombycidendron vidalianum</i> :		
Ilocos Norte	Lusuban	Lusuban.
Ilocos Sur	do	Do.
<i>Hibiscus mutabilis</i> :		
Batangas	Mapola	Mapola.
<i>Hibiscus tiliaceus</i> :		
Albay	Malabago	Malabago.
Batangas	do	Mapola.
Bulacan	do	Balibago, dangliw.
Capiz	do	Malabago.
Iloilo	do	Do.
Pangasinan	do	Do.
Sorsogon	do	Malabago, malobago.
Tarlac	do	Balibago.
<i>Malachra capitata</i> :		
Bulacan	Bakembakes	Sipit-ulang.
Cavite	do	Bulubuluhan, buluhan.
Ilocos Sur	do	Bakembakes.
Iloilo	do	Labug-labug.
Occidental Negros	do	Do.
Pampanga	do	Bulbulin.
Union	do	Bakembakes.
<i>Sida acuta</i> :		
Bulacan	Tacling-baca	Uualisin.
Ilocos Norte	do	Tak-kimbaca.
Ilocos Sur	do	Herbaca, tak-kimbaca.
Isabela	do	Attay-nab-baca, tak-kimbaca.
Nueva Ecija	do	Walisialisan.
Pangasinan	do	Tacling-baca.
Tarlac	do	Calisoalisan, tacquinvaca, ualis-ua-lisan, maratak-kimbaca.
<i>Thespesia lampas</i> :		
Ilocos Sur	Marakapas	Maratarong.
Mountain	do	Marakapas.
Nueva Ecija	do	Amagong.
Zambales	do	Macacapas.
<i>Urena lobata</i> var. <i>sinuata</i> :		
Ilocos Sur	Kollokollot	Kollolot, kollokollot.
Isabela	do	Kuluk, kullu-kulluk.
Mountain	do	Kollokollot.
Nueva Vizcaya	do	Kollokollot, afulut, puot sinuang.
Tarlac	do	Kollokollot.
<i>Abroma augusta</i> :		
Bataan	Anabo	Ambong.
Batangas	do	Anabo, ambong.

Plants reported by teachers, etc.—Continued.

BAST FIBERS—Continued.

Scientific name and province.	Common name.	Local name.
<i>Abroma augusta</i> —Cont'd.		
Bohol	Anabo	Anabong, labon, nabo, nabu.
Bulacan	do	Ambong.
Cagayan	do	Nabu.
Capiz	do	Anabo.
Cavite	do	Ambong.
Ilocos Norte	do	Annabo, bodobodo.
Ilocos Sur	do	Anabo, annabo.
Laguna	do	Ambong.
Mindoro	do	Anabo.
Nueva Ecija	do	Do.
Nueva Vizcaya	do	Anafu.
Occidental Negros	do	Anabo.
Oriental Negros	do	Anabong, labon, nabo.
Pampanga	do	Anabo, pacalcal.
Rizal	do	Ambong.
Sorsogon	do	Bago.
Tarlac	do	Annabo.
Tayabas	do	Ambong.
<i>Helicteres hirsuta</i> :		
Ilocos Sur	Tongtonking	Kakaag.
Mountain	do	Tongtonking.
<i>Kleinhofia hospita</i> :		
Albay	Tanag	Hamitanago, tanag.
Antique	do	Hamitanago.
Batangas	do	Tanag.
Bohol	do	Hamitanago.
Bulacan	do	Tanag.
Camarines	do	Bitnong.
Capiz	do	Tanag, hamitanago.
Cebu	do	Hamitanago.
Ilocos Norte	do	Bitnong.
Ilocos Sur	do	Do.
Iloilo	do	Tanag, hamitanago.
Leyte	do	Hamitanago.
Nueva Ecija	do	Tanag.
Nueva Vizcaya	do	Bafe nga bunsung, bitnong.
Occidental Negros	do	Hamitanago.
Oriental Negros	do	Do.
Pampanga	do	Panampat.
Samar	do	Hamitanago.
Sorsogon	do	Tanag.
Tarlac	do	Tanag, bitnong.
Zambales	do	Biknong.

APPENDIX C.

BUREAU OF EDUCATION,
Manila, October 2, 1913.

CIRCULAR }
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CLASSIFICATION OF PHILIPPINE INDUSTRIAL MATERIALS.

To division superintendents:

The need of some definite scheme for the classification of industrial fibrous materials of the Philippines has become insistent. This need arises from the fact that the same fiber has been assigned to different classes by various writers and as a result references to and orders for materials are frequently misunderstood. To overcome this difficulty, an outline has been drawn up in which an attempt is made to assign each of the important industrial materials to a definite class. The class names thus established will hereafter be used by this Bureau.

The classification which is here made is, no doubt, like other classifications, more or less arbitrary. However, this outline is based primarily upon what is believed to be the most important consideration; namely, the use of the industrial material. Its appearance and derivation are considered as of secondary importance.

All available authorities have been consulted in drawing up this outline, in order that usage in the Philippines may conform as closely as possible to that of systems established elsewhere.

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Director of Education.

CLASSIFICATION OF SOME PHILIPPINE INDUSTRIAL MATERIALS.

I. STRAWS.

The whole round stalks of grasses, sedges, rushes, and the like which are pliable enough to be platted, or the same when split but curled round like whole stalks.

1. Grass straws:

- (a) Rice straw.
- (b) Wheat straw.
- (c) Cobboot straw.
- (d) Bacuit straw.

2. Sedge and rush straws:

- (a) Tikug straw.
- (b) Balangot straw.
- (c) Tiker straw.
- (d) Chinese matting straw.
- (e) Japanese matting straw.
- (f) Cat-tail straw.
- (g) Alinang straw.
- (h) Tayoc-tayoc straw.

II. STALKS.

The whole stalks of grasses, sedges, palms, and the like, which are not pliable enough to be platted.

1. Grass stalks:

- (a) Vetiver stalks.
- (b) Cogon stalks.
- (c) Tambo stalks.
- (d) Talahib stalks.
- (e) Bigao stalks.
- (f) Bamboo stalks.

2. Other stalks:

- (a) Tiquio stalks.
- (b) Rattan stalks.
- (c) Agas stalks.

III. SPLINTS.

Fairly coarse, stiff, fibrous pieces split off from stalks, stems, and other parts of plants, and used as ribs or coarse weavers in baskets and the like.

1. Splints from stalks:

- (a) Bamboo splints.
- (b) Cogon splints.
- (c) Vetiver splints.
- (d) Tambo splints.
- (e) Talahib splints.
- (f) Banban splints.
- (g) Rattan splints.

2. Splints from palm petioles.

- (a) Dumayaca splints.
- (b) Sugar-palm splints.
- (c) Buri-palm splints.
- (d) Saguise splints.
- (e) Coconut splints.
- (f) Nipa splints.
- (g) Pugahan splints.

3. Midrib splints:

(a) Buri midrib splints.

4. Splints from stems and roots:

(a) Nito splints.

(b) Kilog splints.

(c) Air-root splints.

IV. STRIPS.

Rather thin, supple, soft, more or less flat strips, taken from any stalk, petiole, etc., or from a thin leaf blade.

1. Leaf strips:

(a) Buri strips.

(b) Pandan strips.

1. Sabutan strips.

2. Karagumoy strips.

3. Common pandan strips.

4. Majayjay pandan strips.

5. Bariu strips.

(c) Coconut strips.

2. Strips from splints, midribs, roots, and stems:

(a) Bamboo strips.

(b) Calasiao strips.

(c) Irao strips.

(d) Rattan strips.

(e) Nito strips.

(f) Air-root strips.

3. Strips from straws (split straws).

4. Bast strips:

(a) Lubusan strips.

(b) Jute strips.

(c) Anilao strips.

(d) Gomamela strips.

(e) Tacling-baca strips.

(f) Anabo strips.

(g) Tanag strips.

5. Lupis strips:

(a) Abaca lupis strips.

(b) Banana lupis strips.

V. RAFFIAS.

The thin skin of leaves:

(a) Buri raffia.

(b) Pandan raffia.

VI. FIBERS.

The extracted or naked fibers of any parts of plants.

1. Structural fibers:

- (a) Abaca fiber.
- (b) Piña fiber.
- (c) Maguey fiber.
- (d) Buntal fiber.
- (e) Bowstring hemp fiber.
- (f) Vegetable sponge.

2. Surface fibers:

- (a) Coir fiber.
- (b) Cotton fiber.
- (c) Kapok fiber.
- (d) Cabonegro fiber.
- (e) Pugahan (kittul) fiber.

VII. ROOTS.

1. Air roots:

- (a) Amlong.

2. Ground roots:

- (a) Bamboo roots.
- (b) Vetiver roots.
- (c) Coconut roots.

VIII. STEMS.

- 1. Orchid stems.
- 2. Fern stems.
- 3. Pamago stems.

IX. MIDRIBS.

- 1. Palm-leaf midribs.

X. SHEATHS.

- 1. Bamboo sheaths.
- 2. Areca sheaths.
- 3. Coconut sheaths.

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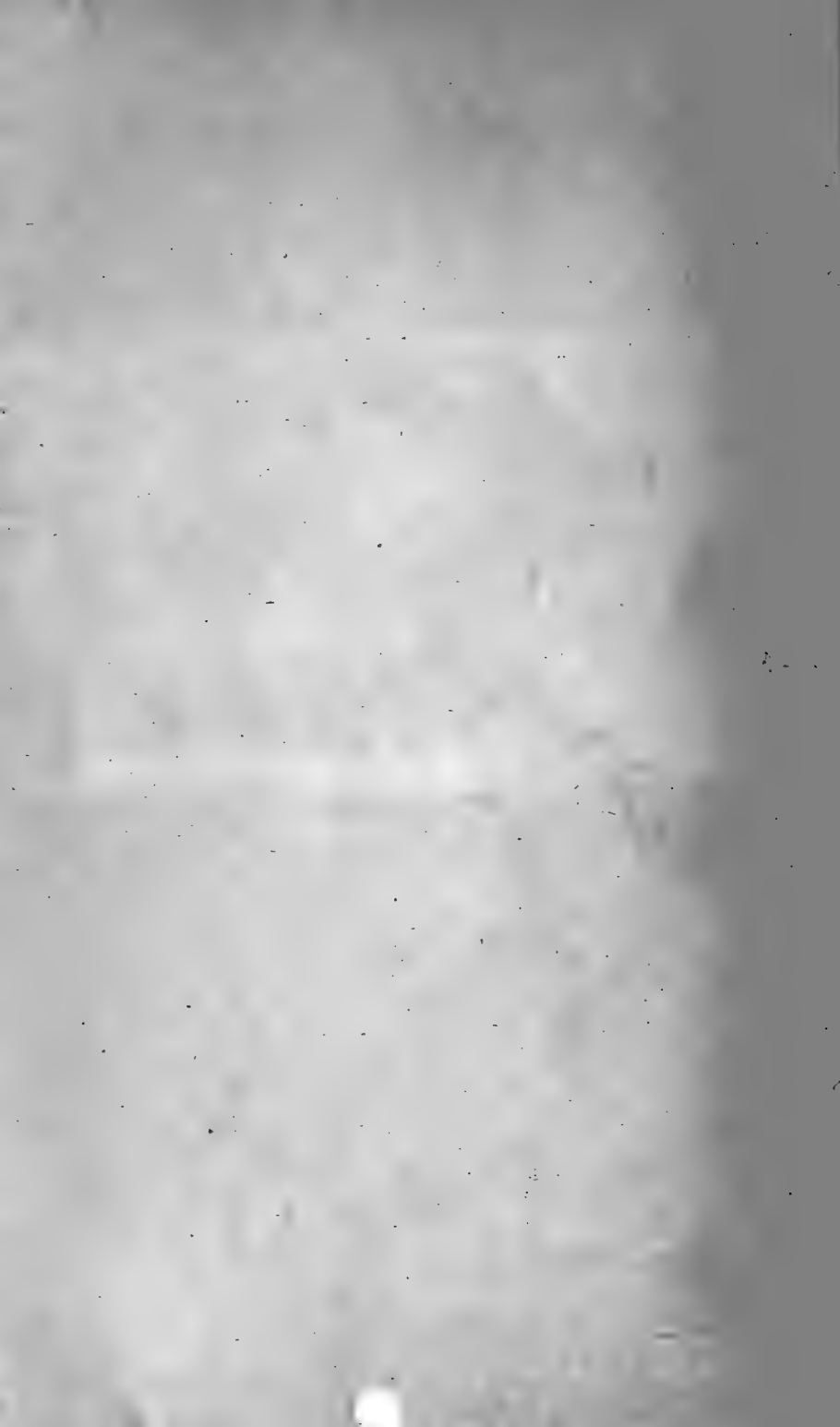
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Display of Philippine plant fibers at the Manila Exposition in 1912.



Plants and fibers of abacá or so-called Manila-hemp (*Musa textilis*).

Th. Müller

THE INDUSTRIAL FIBER-PLANTS OF THE
PHILIPPINES¹With Plates CLVII and CLVIII²

Although the Filipino people used the fibers of palms, screw-pines and other plants perhaps from times immemorial, it is primarily due to the untiring efforts of the Bureau of Education in those Islands that the Filipinos were brought to a fuller and deeper realization of the wealth of industrial materials abounding in their country for the manufacture of a great variety of articles of economic importance. It is the purpose of this article to describe briefly the important fiber-plants in the Islands and to illustrate how and in what way fibers are prepared and utilized. As a matter of convenience the plants will be grouped under various headings, the classification indicating botanical relationship rather than present economic importance.

PALMS

One of the tallest of the palms growing in the Philippines is *Corypha elata*, commonly known in the Islands as the Buri palm and in India as the Talipot palm. The palm is characterized by large orbicular leaves near the apex of its trunk. After reaching maturity, variously estimated at from 25 to 45 years, it flowers and fruits once and then dies. It is interesting to note that the palm develops a much branching inflorescence often 20 feet high. Between the ages of five and twelve years the plant is of the greatest economic value.

The young unopened leaves of the shoot, while still yellow and without chlorophyll, are spread out to dry in the sun and then cut up into strips. Such strips are used for sugar bags and coarse mats. If the strips are to be used for better and finer grade articles, they are bleached more thoroughly by boiling them in water containing vinegar, or in various other ways. These

¹ An exhibit of the chief industrial fiber-plants of the Philippines will soon be ready for public inspection in the Museum Building of the New York Botanical Garden.

² Plate CLVIII was furnished through the courtesy of Mrs. Mabel R. Dow, who conducts a basketry store at 173 Madison Ave., N. Y. City.

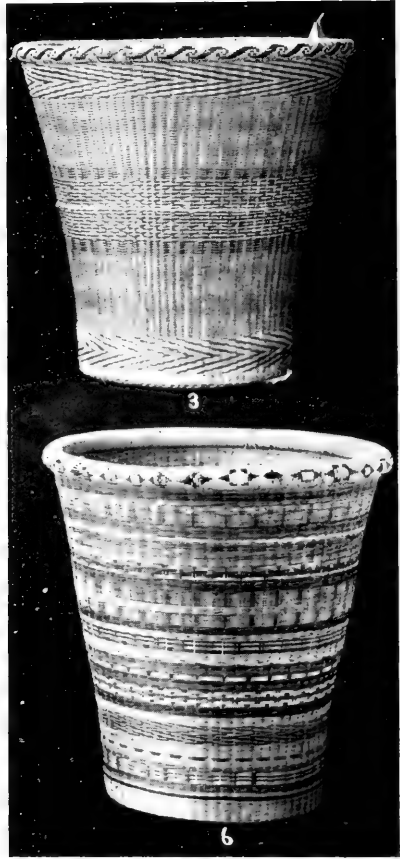
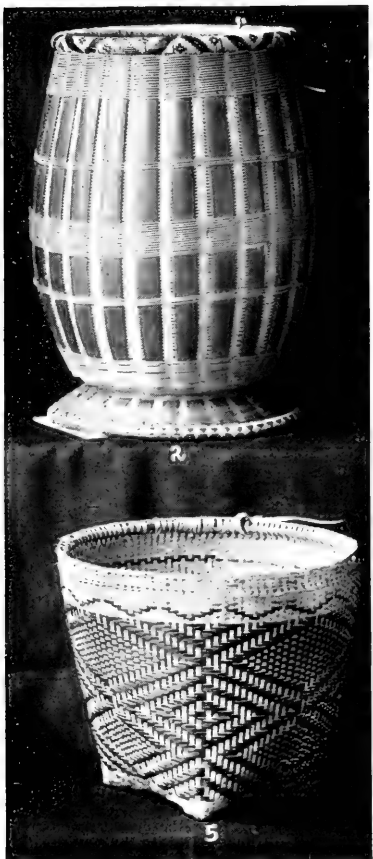
strips are used mainly for hats, baskets, handbags and tobacco cases. The epidermis of the unopened leaflets can readily be removed and is known as raffia. This is equal in strength to the Madagascar raffia which is more commonly found in the U. S. market. In the Philippines raffia is often woven into cloth. The schools have extended the use of raffia to the manufacture of screens, carriage cushions and bags in macramé weave.

The midribs of the unopened leaves, while still yellowish-white in color, are bleached, spliced, and made into very fine hats known in Manila as Calasiao hats and in the Visayas as Pototan hats. Because of their good wearing qualities and dressy appearance they are much admired by Filipinos and have a well-established market.

The petiole of the opened Buri leaf is cut into sections two to three feet long. One end of it is frazzled and the inner fibers, mostly stereome tissue, are pulled out by hand. While the process is apparently simple it requires dexterity and skill to avoid breaking the fibers as they are being pulled out. Another way of getting the fibers is to pound the whole petiole and then pull the fibers out; but on drying it is found that such fibers frequently become discolored. These fibers are made up chiefly into hats, beautiful in texture and appearance, and are known in the Philippines as Buntal hats. In the U. S. market these hats usually unbleached and of medium quality and grade are known as Bangkok hats.* The fibers are also excellent for small baskets.

Within the last few years it was discovered that the petioles furnished an excellent basketry material needing no artificial dyes to enhance the beauty of the natural product. Thus, scraping off the epidermis of an old petiole, splints dark brown in color verging almost to a black may be obtained. Younger petioles yield lighter shades. Still lighter material is obtained by scraping below the darker portions of the petioles. Thus great variations in color are obtainable by proper manipulation, and the colors are permanent. The chief palms so used are *Arenga mindorensis* and *Arenga saccharifera* (sugar palm). The

* Inquiry of the U. S. consul at Bangkok elicited the information that no hats are made in the town except in prison, and that these hats are manufactured only for prison consumption.



Waste baskets made chiefly of bamboo and palm fibers.

sugar palm also furnishes material for rope that is highly resistant to the action of salt water. To a less degree the fibers surrounding the trunk are suitable for bristles of brushes.

The coconut-palm may be mentioned here for its fiber products. The leaves are used extensively for roof-thatching. The fibers surrounding the nut (coir) are employed in the manufacture of door mats. The midribs of the leaves are strong enough for chairs and tables. The central cylinder of the young roots of the coconut-palm can be utilized as basketry material.

The nipa palm (*Nipa fructicans*) plays an important part in the industrial life of the Filipinos, as it is the principal source for the manufacture of alcohol. Its leaves are used even more extensively than those of the coconut-palm for thatching. Some slight use is made of the splints and midribs obtained from the petioles and leaves.

In former times, hats were made in the Philippines from fine splints obtained from species of rattan, especially *Calamus mollis*. Now the weaving of rattan splints into hats has been almost abandoned because of the difficulty in preparing fine splints from the stem and the skill required in weaving the short fibers into a hat. Besides, weaving can only be done, when the air is sufficiently moist. The hats are beautiful and durable and are sold at almost any price from fifteen dollars (\$15.00) up.

The little town of San Miguel, Bulacan, is the center of the native rattan chair industry in the Philippines. The chairs are patterned after Vienna chairs.

SCREW-PINES

Growing usually in profusion along the littoral of the Philippines is the common screw-pine, *Pandanus tectorius*. Very little use is made however of its fiber, although it seems that the epidermis of this pandan leaf, or of one very similar to it, is used extensively in Japan for the manufacture of "Panama hats."

The pandan that enjoys the greatest popularity among the Filipinos because of its flexibility and softness is *Pandanus sabotan* or *Pandanus tectorius* var. *sinensis*. No female inflorescence of this pandan has ever been found and so Philippine

botanists do not agree whether this pandan constitutes a distinct species or is only a more or less cultivated variety of the common sea-shore pandan. No further preparation except the removal of its spines is practised. The strips are sometimes bleached, but with rather indifferent success. The fiber if properly bleached would be excellent for "Panama" hats. This screw-pine is used extensively by Filipinos for hats and for their best quality of mats.

A screw-pine with coarse leaves is *Pandanus utilissimus*. The leaves of this screw-pine must be rolled under heavy logs before they can be used. The strips are utilized for mats and telescope baskets, and are exported in large quantities from Laguna Province to the Manila market.

Another pandan of economic importance, used especially in the southeastern provinces of Luzon, is *Pandanus simplex*. This pandan is not as coarse as *P. utilissimus* and is utilized in the same way as the latter.

Among the pandans used occasionally are *P. copelandii*, *P. dubius*, *P. luzonensis* and *P. radicans*.

GRASSES

Bamboo, especially the cultivated species *Bambusa blumeana*, plays a highly important role in the daily life of the Filipino people. The majority of the houses in the Philippines are built of bamboo. Long hollow bamboo tubes serve for carrying drinking water from river or well. The aborigines (Negritos) cook rice, their principal food, in green sappy bamboo over an open fire. The rafts that carry the products up and down the river are made of bamboo. So in a thousand and one ways bamboo enters intimately into the daily economic life of the people. It is not however its general uses that will be considered here, but its use in the making of hats.

The spiny bamboo, *Bambusa blumeana*, is the species usually employed in the manufacture of hats. The bamboo is felled when it is from four to five months old before it has developed any branches. At this age the bamboo is perhaps fifty or more feet high. Only the middle internodes of the stem, fifteen to

twenty in number, are used. Both the upper and lower internodes are discarded, for the former is too weak and the latter too coarse for hat material. The stem, after being cut, is allowed to wilt for about twenty-four hours. Then sections are cut at the nodes, and each cylinder is divided into three or four parts and flattened. Part of the inner surface and of the outer are cut off and thrown away. The remaining portions which are perhaps one quarter to three eighths of an inch thick are then spliced into from four to ten layers. Needless to say it requires experience and skill to obtain these layers, which are often as thin as tissue paper. The layers nearest the green epidermis are considered the finest and best. The material is then boiled in water for about half an hour and bleached in the sun, a strengthening and whitening process. It is then ready to be woven into hats.

A thick-walled bamboo used in constructing houses and bridges, and for other purposes is *B. vulgaris*. Among the thin-walled bamboo used in a variety of ways may be mentioned *Schizostachyum acutiflorum*, *S. dielsianum*, *S. fenixii*, *S. hallieri*.

Turning to grasses herbaceous in structure we find vetiver, *Andropogon zizanioides*. Two varieties of this well-known tropical grass occur in the Philippines. One of these has fragrant roots (var. *genuina*), while the other (var. *nigritanus*) has not. The former variety may be recognized by its terminal dark purple panicles and distinct awns on the spikelets. The var. *nigritanus* has terminal greenish or purple panicles, usually the latter, and the spikelets are either unawned or armed with short awns. The fragrant roots are sold by itinerant vendors in the streets of Manila and are used by the women to put into clothes chests, trunks, etc. Philippine schools are introducing the use of these roots in making fans. Occasionally hats are made from the flower stalks.

Considering the great use of rice straw by the Japanese it is curious to note that the Filipinos hardly make any use of it. The Bureau of Education is encouraging the use of rice straw among the Filipinos.

The panicles of *Phragmitis vulgaris* are used extensively for

making brooms. The best native brooms are made however from the panicles of *Thysanolaena maxima*.

Among the grasses that find more or less use may be mentioned Job's tears, *Coix-lachryma-jobi*. The hard-shelled seeds are used for rosaries or made into curtains, baskets and trays of various kinds. Cogon (*Imperata cylindrica* var. *koenigii*; *I. exaltata*) is the weed pest in the Islands. The whole plant is used for thatch among the very poor. The flower stalks are occasionally used for hats. A grass that has been found excellent for slippers is "cobboot," *Ischaemum angustifolium*. Often Filipinos decorate their houses with such grasses as *Apluda mutica*, *Eleusine indica*, *Ophiuris corymbosus*, *Erogrostis tenella*, *E. viscosa*.

SEDGES

The Filipinos, except the well-to-do, follow the custom prevalent in the east of sleeping on mats which are placed on the floor at night and rolled up and put out of sight in the morning. These mats are made as a rule of pandan or sedges. The sedge most commonly used for this purpose is *Fimbristylis utilis*. This plant is found growing wild and in great abundance in and around the rice paddies in parts of the Visayas and Mindanao. It reaches its greatest economic importance on the islands of Samar, Leyte, Mindanao and Bohol. *F. utilis* may attain a height of three meters but the average is one and a half meters. After the removal of the inflorescence the sedge is dried with proper precautions and manipulated by hand or ruler to make it pliable. Great skill is shown especially in Samar in weaving intricate colored designs into mats. With proper looms this material can be woven into matting. The sedge is also utilized locally for the making of hats.

F. diphylla is also used for mats. The material though finer than that obtained from *F. utilis* is considerably stiffer and shorter and consequently is not considered as good a mat fiber.

In various parts of the Islands occurs *Cyperus radiatus*, which is utilized for mats but to a less degree than the sedges previously mentioned. *C. malaccensis*, common along brackish swamps and tidal streams not only in the Philippines but also throughout the

tropics, is made into slippers. It is interesting to note that the making of slippers from this fiber was started about 1907 or 1908 in a small village in the Islands by two Japanese peddlers who passed through the place selling small rice-cakes. Seeing the abundance of *C. malaccensis* they gave up their cake business and turned to the making of slippers. Now almost every house in the little town is actively engaged in making these slippers which are sold by the thousand throughout the Islands.

The Chinese matting sedge, *Cyperus tegetiformis*, is not found in the Philippines. The Japanese matting rush, *Juncus effusus*, cultivated extensively in Japan for the making of the finest matting is found growing wild in the Philippines but is not used. It seems probable that cultivation would improve the quality of the fiber. Its coarseness in the wild state is the principal objection at present to its use by Filipinos.

Various species of *Scirpus*, such as *S. erectus*, *S. grossus*, *S. lacustris* and *S. mucronatus*, find occasional uses for different purposes. In connection with sedges might be mentioned our common cat-tail, found in abundance in various parts of the Islands, but not used to any great extent.

VINES

Many vines growing in the tropics develop air-roots high above the ground from long, clambering and fleshy stem-structures.

A description of the forest near Puerta Galera, Mindoro, where the writer found air-roots in plenty, should prove of interest to those unfamiliar with the habitat of these aroids. A good half day's journey from town, Araceae with air-roots were found in fair quantity on the sides of heavily wooded mountains, but more plentiful in ravines or gulleys. In these places bird's-nest ferns were very abundant and the bark of many trees was covered with moss. So humid were the surroundings that even the edges of many leaves were covered with fringes of moss. The trees and plants were so close together that only a little of the light of the sun was able to find its way to the ground through the dense mass of foliage. The earth even after a

bright sunny day was found damp late in the afternoon. The ground was covered with decaying vegetation. It was a country in which leeches and mosquitoes were plentiful. The forest trees grew to a great height. The leaves of the aroids were around the upper part of the trunks of the trees and roots of various lengths dangled down from aroid stems.

The tips of air-roots are generally from six to fifteen feet from the ground, and are obtained by simply pulling them down. Depending on the strength of the pull and the luck of the gatherer he will be able to obtain pieces of roots ranging in length from a few feet to sixty or more feet. The epidermis and cortex are readily removed exposing the central cylinder which is used in basketry. While the Filipinos previously employed the roots only for tying purposes their utilization as a basketry material has only come within recent years. The central cylinders of the air-roots on first being removed are yellowish-white in color. In some species, *e. g.*, *Epipremnum elmerianum*, they remain white; in others, *e. g.*, *Raphidophora copelandii*, they are oxidized to a light-brown; while in others, *e. g.*, *R. merrillii*, they turn to a dark-brown or almost black color. The colored air-roots may be bleached by the common bleaching agents.

One of the *Menispermaceae*, *Pericampylus incanus*, has been found very serviceable as a basketry material. After removal of the leaves, the vine is boiled in water for about two hours when the epidermis and the cortical region are easily removed. After sandpapering the material it is ready for use. It is not however as good a basketry material as the air-roots owing to the presence of leaf scars.

Among vines of lesser importance in the Philippines may be mentioned the vegetable sponge, *Luffa cylindrica*, which in the provinces of Abra and Bulacan is used occasionally for children's hats. The use of the vegetable sponge for bathroom articles is unknown to the Filipinos.

Entada scandens, a vine in the family of *Leguminosae*, has an almost universal use in the Philippines as a substitute for soap.

COMMERCIAL LEAF OR PETIOLE FIBERS

The industrial fiber par excellence, whose successful cultivation has not been found possible outside of the Philippines, is abacá, or Manila hemp, *Musa textilis*. Typical plants of this species together with fiber in the process of drying are shown in plate CLVII. The impression often prevails, however, that its use is restricted entirely to the making of rope; little being known of its employment for braid or for the making of excellent and strong cloth known in the Philippines as "pinolpog." Little is known too outside of the Islands of the making of abacá fiber into a fabric called "abacá sinamay." The schools have extended the use of the fiber to the making of a great variety of articles.

The fibers are obtained by cutting off the leaves and pulling the petioles under a dull knife. Various machines have been invented to do away with this hand labor but none has so far proven very successful.

Instead of removing the individual fibers from the petiole, the whole outer epidermis may be removed and then divided into strips. These strips are known as "lupis" and are very serviceable in the making of coiled baskets.

If the fibers are to be used for braid or cloth they must be tied together. This knotting is very neatly done by hand so that the knots are hardly perceptible in the skein. The braid is known in the millinery trade in the U. S. as "tagal" braid and is imported from Switzerland.

Pinolpog is made by weaving the fibers into cloth and then softening the latter by winding it around a piece of wood and beating it thoroughly with sticks as it is being wound.

Abaca sinamay is a gauzy fabric used by Filipino women for waists (camisas) or like buckram to stiffen the bottom of skirts.

The extension work of the schools utilizes the fiber wholly or in part in the manufacture of slippers, coiled baskets, bags, lace, lamp-shades, belts and furniture.

Several varieties of the banana, *Musa paradisiaca*, are utilized for the manufacture of coarse and fine fabric depending on the quality of the fiber used. The fiber is prepared in the same way as abacá. Greater care is however necessary in its extraction

from the petioles, as the fiber breaks more readily. "Banana sinamay" as the fabric is called is in great demand by Filipino women for dress material.

The very finest cloth in the Philippines, almost as delicate as a spider's web, is made from the leaves of the pineapple plant. The fibers are obtained by scraping the leaves with a blunt object of some kind such as a piece of pottery, bamboo, iron and the like.

In a number of provinces *Agave cantula* is the species of sisal usually cultivated. The fibers are obtained by retting. The fibers of bowstring hemp, *Zansevieria zeylanica*, are occasionally used for commercial purposes.

MISCELLANEOUS FIBERS

The kapok tree, *Ceiba pentandra*, is found in all provinces in the Philippines, but its silky cotton-like fibers are gathered for trade or export principally in the Visayas. The fibers are excellent as filling material for mattresses, pillows, cushions and life preservers.

Cotton was cultivated formerly extensively in a number of provinces in the Islands, but its present cultivation is rather limited. While household looms still spin cotton yarn in the Philippines, the bulk of cotton goods used in the Islands is imported.

The stalks of *Dendrobium crumenatum*, an orchid with a fluted and bulbous base, is used as a decorative material in basketry. To make the stalks of an even bright-yellow color they are placed for a short time in boiling water or in water to which a little vinegar has been added. Exposing the cut stalks to the sun produces the same result.

Donax cannaeformis, known to the Filipinos as banban, is found throughout the Philippines, and is used much like the petioles of palms for obtaining light to dark-brown splints in basketry.

BAST FIBERS

There are a great many species of plants in the Philippines belonging especially to the family of *Tiliaceae*, *Malvaceae* and

Sterculiaceae that yield bast fibers suitable for the manufacture of rope. It is no uncommon sight to see a Filipino whose cart has broken down draw out his "bolo," hack down a slice of bark of almost any tree, twist the fibers, tie together the broken pieces and go contentedly on his way, smoking the ever present cigarette.

THEODORE MULLER

BUREAU OF EDUCATION PUBLICATIONS—Continued.

(Continued from second page of cover.)

TEXTBOOKS:

Woodworking—A Manual of Elementary Carpentry for Philippine Public Schools. 1908.

Selected Short Poems by Representative American Authors. 1911. Reprint, 1913.

Commercial Geography; the Materials of Commerce for the Philippines. 1911.

Samuel Johnson, Macaulay; Self-Reliance, Emerson; Gettysburg Address, Lincoln. 1911. Reprint, 1913.

Supplementary Problems for Trade Schools and Trades Classes in the Philippine Public Schools. 1913.

Housekeeping—A Textbook for Girls in the Public Schools of the Philippine Islands. (In course of preparation.)

Economic Conditions in the Philippines. 1913.

MISCELLANEOUS:

Domestic Science, A Guide to Practical Instruction in Housekeeping, Sewing, Cooking, and Laundering in Grades Three and Four of the Philippine Public Schools. 1908.

Some Recipes for Preparing Jellies, Preserves, Pickles, and Candies from Philippine Fruits. 1911. (Supply exhausted.)

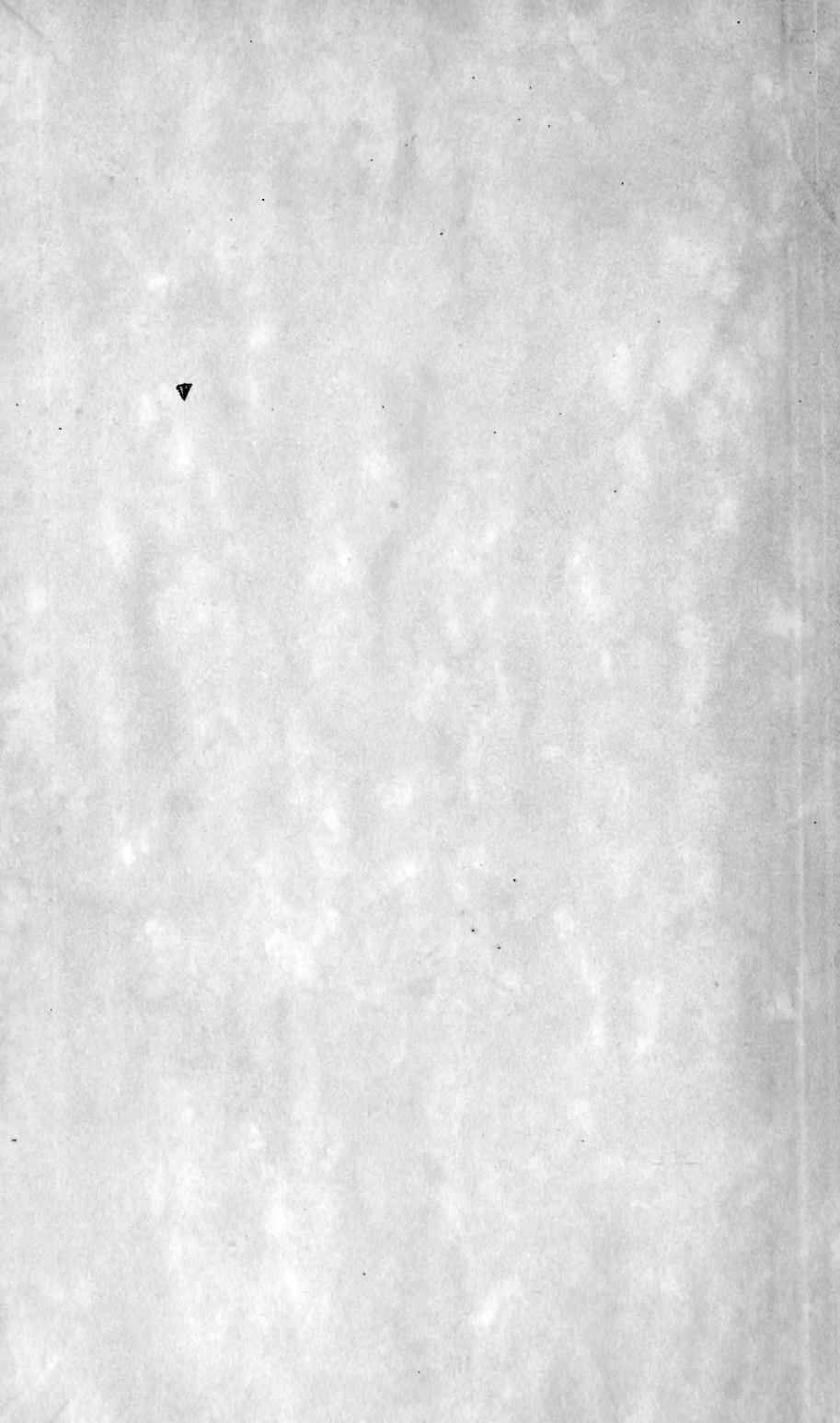
Second and Third Annual Reports on Private Schools and Colleges of the Philippine Islands. 1911 and 1912. (Supply exhausted.)

A Statement of Organization, Aims and Conditions of Service in the Bureau of Education. 1911. (Several editions printed at Manila and Washington.) (Supply limited.)

A Talk on Health Conditions in the Philippines—Dr. Victor G. Heiser, Director of Health. 1912.

PHILIPPINE CRAFTSMAN REPRINTS:

1. Philippine Mats. 1913.



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